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THE INSTITUTION OF PRODUCTION ENGINEERS

JOURNAL
(July, 1947, Vol. XXVI, No. 7.)

Contents:

PRESIDENTIAL ADDRESS TO THE LONDON SECTION
By A. L. STUCHBERY, M.I.P.E. (Retiring President)
"THE STRUCTURE OF MANAGEMENT"
By G. CHELIOTI.

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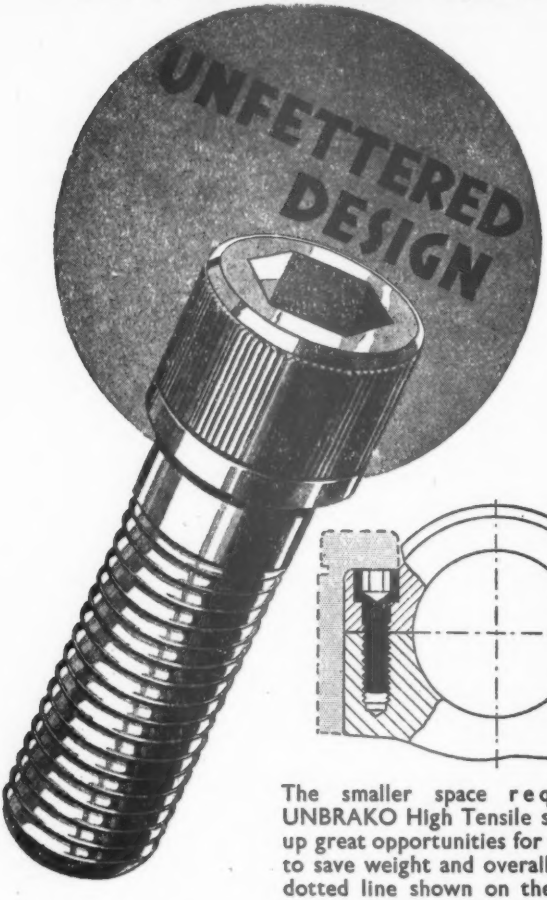

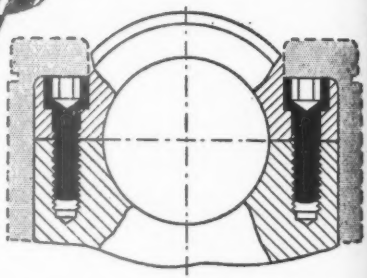

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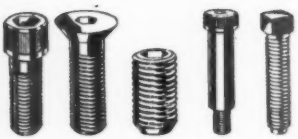

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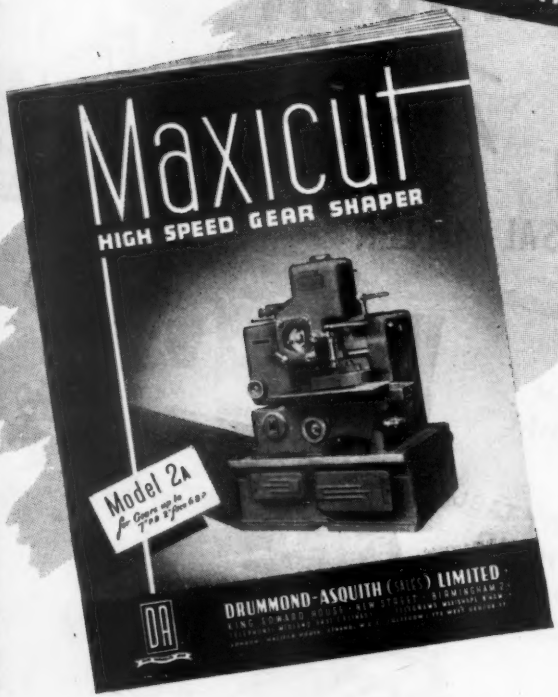

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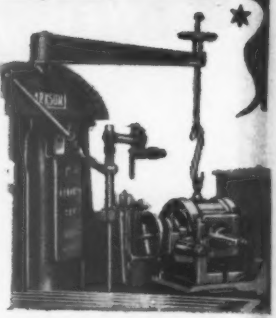

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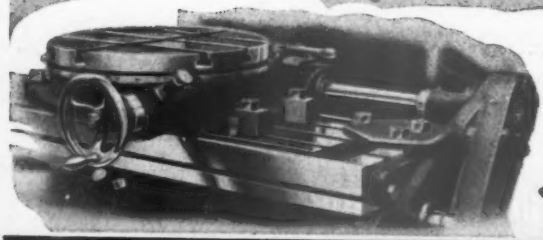

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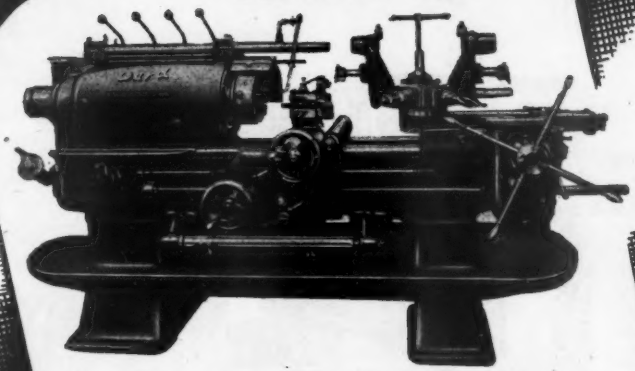

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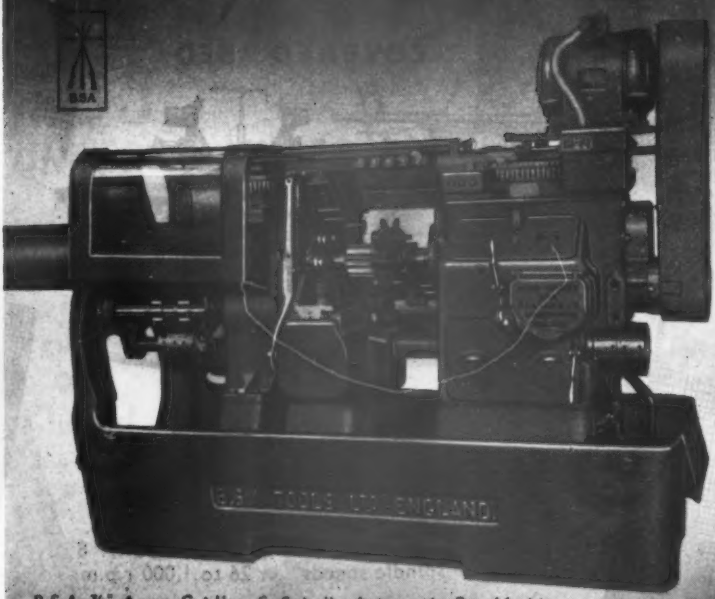

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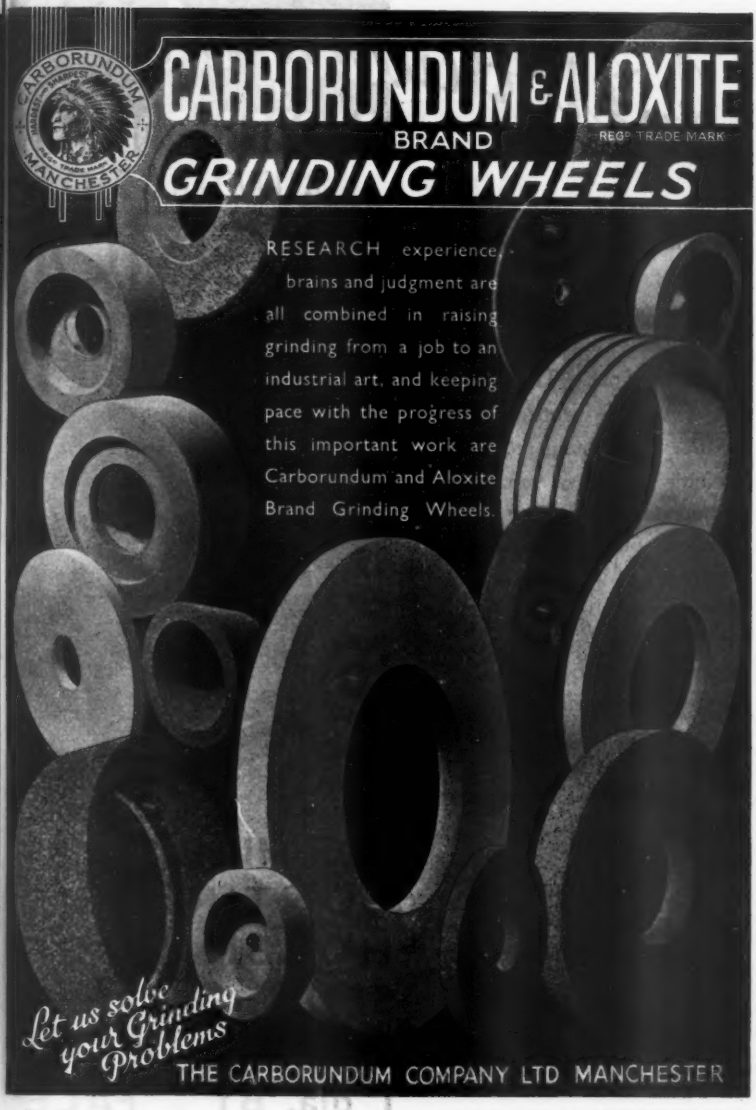
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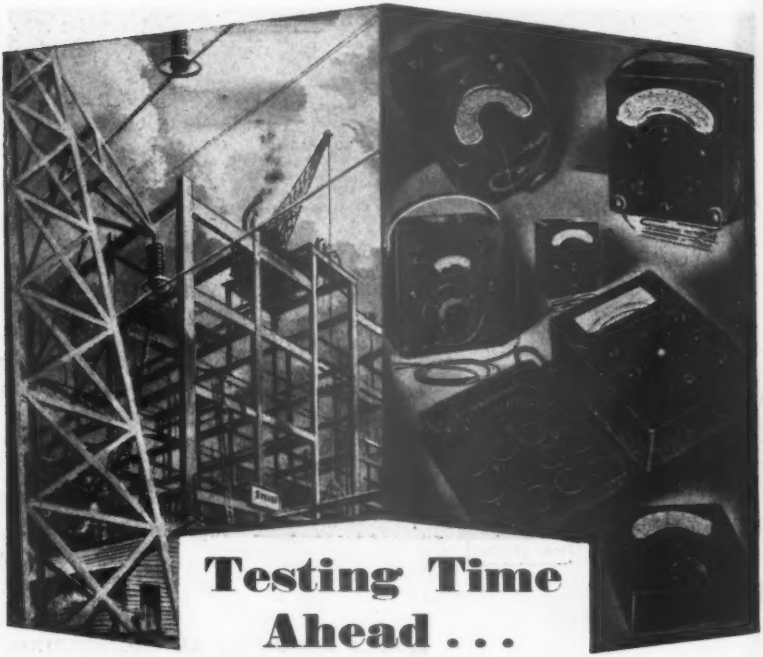

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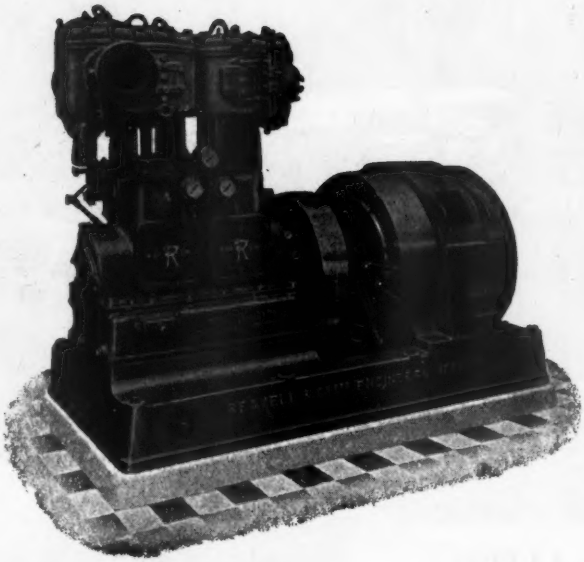

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INSTITUTION NOTES

July, 1947

July Meetings

19th Wolverhampton Section. The American Society of Tool Engineers, at the invitation of the Wolverhampton Section Committee, is sending Mr. H. E. Linsley to deliver an address and to convey a message of goodwill to the Institution of Production Engineers. Mr. Linsley is a past Chapter Chairman (Section President) and a member of the National Programme Committee of the A.S.T.E. The subject of his address will be "The Machine Tool and You," and slides will be shown illustrating some of the latest types of American machine tools. The meeting will take place at the Wulfrun Hall, Civic Hall, Wolverhampton, and will commence at 2-00 p.m.

Personal

Mr. T. W. Fazakerley, A.I.P.E., F.I.I.A., F.C.C.S., has been appointed to the Board of Messrs. P. B. Cow & Co., Ltd., and their associated companies. For the past six years, Mr. Fazakerley has been General Manager of the Company.

Mr. K. A. Critchley, A.M.I.P.E., has been appointed Lecturer in the Mechanical Engineering Department of the Nottingham and District Technical College, Nottingham.

Mr. H. Randle, Int.A.M.I.P.E., has taken up a position as Estimator at the Lockheed Hydraulic Brake Co., Ltd., Leamington Spa.

Mr. W. Goacher, M.I.P.E., has joined The Wallis Tin Stamping Co., Ltd., London.

Obituary

We deeply regret to announce the sudden death of Mr. Wilfred Hill, M.I.P.E., a member of Manchester Section Committee. Mr. Hill had done valuable work for the Manchester Section, and his loss will be keenly felt.

"Precision Engineering"

We have recently received an interesting publication describing the Technical School attached to Messrs. S. Smith & Sons (England), Ltd., Cheltenham. The brochure, which is entitled "Precision Engineering," gives a detailed picture of the work of the school,

which aims to provide training exclusively in the field of precision engineering, and to assist the development of practical technicians of all kinds.

In a letter accompanying the brochure, Sir Allan Gordon-Smith, K.B.E., D.L., Chairman and Managing Director of Messrs. S. Smith & Sons, extends a cordial invitation to all members of the Institution who would care to visit the School. Further particulars may be obtained from Head Office.

Third International Conference on Electrodeposition, 1947

The Council of the Electrodepositors' Technical Society is arranging to hold the first post-war International Conference on Electrodeposition—the third in this series to date—in London, in September, 1947.

The Conference has been arranged in four sessions, as follows :—

Wednesday, 17th September

2-00 p.m.-5-00 p.m. Electrolytic Polishing of Metals. Chairman : The President, Dr. S. Wernick, M.Sc., F.R.I.C., F.I.M.
5-30 p.m.-8-00 p.m. Miscellaneous Processes and Reports. Chairman : Prof. R. S. Hutton, M.A., D.Sc. (Past-President).

Thursday, 18th September

10-00 a.m.-1-00 p.m. Electrodeposition Processes. Chairman: Dr. G. E. Gardam, A.R.C.S., F.R.I.C. (Vice-President).
2-30 p.m.-5-00 p.m. Structure of Electrodeposits. Chairman : Mr. N. A. Tope, A.C.T.C. (Birm.), Grad.I.P.E.

In addition to the above sessions, which will be held at the Hyde Park Hotel, Kensington, London, S.W.1, an Exhibition will be on view throughout the Conference, illustrating recent developments in electrodeposition research and practice.

Arrangements have been made by the Society to reserve limited accommodation in London for foreign and provincial visitors, and members who are interested in the Conference are invited to write for full details to The Conference Secretary, Third International Electrodeposition Conference, Electrodepositors' Technical Society, 27, Islington High Street, London, N.1.

Payment of Subscriptions.

All members are reminded that their Annual Subscriptions fall due on July 1st, 1947. It would affect a considerable economy and greatly facilitate the work of Head Office staff if subscriptions were paid promptly, thus avoiding the necessity of sending out frequent reminders.

Journal Stocks

Because of the severe paper restrictions, we are unable to carry a stock of Journals large enough to meet demands from non-members. It would, therefore, be greatly appreciated if any members who do not wish to bind their Journals, and are willing to relinquish them after perusal, would be kind enough to return them to Head Office. Any issue would be gratefully received, but the greatest demand at present is for the February, 1947, issue.

Issue of Journal to New Members

Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

Important

In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

ELECTION OF MEMBERS

MEETING OF COUNCIL, 25th April, 1947

The following were elected to membership by Council :—

As Members: J. Bailey, Sir C. J. Bartlett, C. W. Clark, R. H. Clark, G. A. Dangerfield, F. J. Everest, A. E. Farren, T. B. Gray, C. M. Holloway, R. L. Jebb, Sir L. Kearns, C.B.E., G. W. Mackintosh, A. H. Pandya, W. A. Robarts, T. S. Smith, R. Sneddon, F. H. Towler, W. E. Waller, C. H. T. Williams, E. A. Wimberley.

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As Intermediate Associate Members: M. F. Adkins, G. Allport, R. Ashby, O. Bansal, F. Barlow, G. D. Beckett, J. Bolwell, F. Boydon, S. Brookes, F. A. Clarke, C. Craven, E. A. Curwood, R. H. Evans, A. Fisher, H. Goldthorpe, J. A. Holinger, B. V. T. Iyengar, P. N. Khanna, C. C. Layng, A. W. Lower, T. W. Ludlow, J. McDonald, W. Minshull, S. Morgan, D. Muir, D. Murray, R. Parker, J. R. Roberts, L. J. Sayer, H. E. W. Taylor, R. V. Taylor, F. W. Thomas, F. C. Tilliduff, R. C. Webster, E. A. Whitehorn.

As Associates: W. D. Cotton, K. R. Kotaiah, L. Marshall, A. E. Philpott.

As Graduates: A. Adhikari, K. L. Bajaj, J. E. Bill, D. J. H. Bridge, A. Brooke, K. Brown, R. G. Brown, F. G. Burrell, N. Cooper, M. Davidson, J. A. Donnelly, W. Elwiss, C. J. H. Fayers, B. Fraser, L. Fraser, J. G. Frostick, J. E. Gunningham, M. T. Harley, G. Haaes, L. H. Janes, T. H. Jeens, L. P. Kennett, W. L. Kuttner, E. F. Lines, H. Maddocks, J. Metcalfe, L. R. Mumford, F. Newitt, J. Pearce, D. F. Roper, R. N. Rough, F. A. Smith, R. Stephenson, K. J. Thompson, R. L. Urwin, R. G. J. Vollrath, D. White, H. Wiley.

As Students: D. A. Abernethy, K. G. Allport, G. B. Anderson, L. I. Anderton, J. Birch, P. R. Bowen, J. R. Bradshaw, R. D. Broadhead, S. S. Brookes, F. C. Browning, R. G. Buggins, W. F. Burgess, B. Burkinshaw, F. O. Butterfield, P. B. Clay, L. H. Cope, P. R. Deacon, V. G. F. Defago, P. J. Eberth, L. J. Hakes, J. G. Hall, R. L. Harper, A. G. Henry, W. E. Hipkiss, A. Holliday, P. Iredale, R. A. Kevan, F. V. Kingdon, G. Lake, E. Lumb, W. B. McLarty, D. C. Marley, J. L. Meyrick, I. W. Monroe, R. H. G. Moorman, C. J. Newman, E. Noble, H. S. Owen, W. A. Park, T. Parkin, C. S. Phillips, B. M. Rea, G. H. Rowlands, D. E. Rudall, A. A. Ryall, J. S. Steele, C. J. Stockdale, P. A. Taylor, W. Tindale, H. A. Tokley, R. K. Warner, G. N. Wells, B. T. Wilkinson.

Affiliated Firms :	Change of Affiliate Representatives :
Thos. Firth & John Brown, Ltd.	E. Mensforth.
	Dr. C. Sykes.
Burton Griffiths & Co., Ltd.	J. E. MacLaren.

Affiliated Firm :	Additional Affiliate Representative :
Lockheed Hydraulic Brake Co., Ltd. ...	E. Beaumont.

COUNCIL ALSO APPROVED THE FOLLOWING TRANSFERS :—

From Associate Member to Member : H. Barlow, A. Goldman, J. E. MacLaren, J. A. W. Mills, F. G. Phipps, M. Seaman, R. Taylor.

From Associate to Member: G. E. Lumb.

From Intermediate Associate Member to Associate Member : L. L. Bott, S. Coates, G. W. Comer, F. Cook, G. E. Dance, J. R. W. Danks, J. W. Gardner, G. J. Harrop, J. Helliwell, P. Hill, L. H. Hubbard, H. M. James, L. H. Park, R. D. Preece, C. P. Sexton, W. H. Simpson, C. G. Smallwood, F. E. V. Spencer.

From Associate to Associate Member : E. R. Jacobs, H. Teasdale.

From Graduate to Associate Member : J. Baker, L. Baker, L. G. Barton, W. J. Elliott, C. R. Harrap, K. C. Johnson, F. H. Massiter, F. B. Schofield, G. L. Spital, J. A. W. Styles.

From Graduate to Intermediate Associate Member : K. C. Bairstow, J. F. D. Giecco.

From Student to Graduate : F. A. Broad, W. T. Campbell, W. S. Chipping, H. C. Cleaver, P. Crann, R. A. Durrant, C. J. Emery, J. Y. Gardner, E. G. Harrison, S. H. Hibberts, J. R. Ladkin, R. H. Poole, R. J. Read, J. Reed, G. D. Robson, J. Spiegel, D. E. Taylor, D. Walker, E. A. Wright.

Address to the London Section of the Institution of Production Engineers at the Annual General Meeting, April 9th, 1947.

by A. L. STUCHBERY, M.I.P.E. *(Retiring President.)*

Gentlemen,

When I proposed this meeting I was sensible first of the fact that the formal Annual Meeting of Members of the Section has tended to disappear from the regular Proceedings during the war years. There were, of course, excellent reasons why this should be so, but my feeling is that such isolation of your Committee necessarily deprives it of the guidance it is entitled to expect if it is to perform its tasks with satisfaction to the members, and I feel that it is time we made an attempt to correct the state of affairs created by the war. I feel, too, that our ordinary lecture meetings give no opportunity for members to become more intimately acquainted, and I recall the fact that membership has grown very considerably during the recent years, and no real steps have been possible to bring these new members into more active association with the work of the Institution.

All members have from time to time been invited to offer suggestions as to the Section's proceedings, but we have not previously had a meeting where, in an intimate atmosphere, we could reflect together on the past and consider together the future.

During the past year we have had a series of lectures, the quality of which in their respective spheres has been excellent. In every case they were well attended, despite extremely bad weather on two occasions. In every case but one the subject matter was technical, and in every case the discussion was lively. In the one exception to a purely technical subject, we had a lecture from Mr. Chelioti on "The Structure of Management," and in fact this lecture secured the largest attendance of the session. During the session, four visits have been paid to factories of special interest, and further visits have been arranged.

During the year the Institution celebrated its 25th Anniversary, and this Section had the pleasure of acting largely as host Section. I was personally pleased that so many London members were prepared to offer hospitality to provincial members on that occasion, and I regret that more advantage was not taken of those offers.

In considering these brief items from the year's work, and bearing in mind the observations with which I opened this address, I have reflected upon the true objects of the Institution and the road it has travelled since it was founded 25 years ago. I hope that apart from other considerations the fact that I have been a member for 23 of those 25 years will permit me to speak with added authority.

The Institution of Production Engineers does not accept responsibility for any statements made or opinions expressed in any papers published in the Journal of the Institution.

Primarily the Institution was formed to advance the status and practice of Production Engineering. It came into being because of experience gained on production matters during the 1914-18 war, when for the first time war became almost exclusively a sphere of applied engineering, making demands on the industrial life of the nation quite beyond anything that had previously been envisaged. Many here may remember the problems which arose in those distant days, and what uphill work was involved in getting those concerned with function to consider also the problems of production. Production achievements of that period undoubtedly justified Production Engineers in their calling, whilst the problems which remained justified their attempt, through the formation of this Institution, to set a high standard for those who would, in the professional sense, practise the principles of Production Engineering, widening the circle of their influence for the benefit of industry generally.

It is perhaps surprising that it should have needed the first World War to institute, in the leading industrial nation of the world, a corporate body of professional men who, as individuals, had been so indispensable to the industrial machine. The fact is that we all too readily continue to perform functions to which we have become accustomed, without the objective examination of the underlying principles. In times of that form of National Emergency which required a rapid expansion of those able to perform, this objective analysis becomes essential and fundamentally it was this need, so amply shown by the first World War, which made our Institution a necessity.

Between the wars a great deal of progress was made, and our Institution grew both in members and in influence. Richard Hazelton, our first full-time Secretary, was a man of great vision and great organising ability. To him this Institution owes a great debt, for it was he who sustained the early members in their objects, and worked so tirelessly for their achievement.

I think it is true that by the time production problems of the second World War came, the primary object of the Institution had been achieved. The technical problems had been critically examined and sound principles formulated and established in the years between. By now almost all enlightened industry accepted the essential character of the contribution available from Production Engineers as a definite profession.

By this time, however, the field had widened. No longer could our problems be enunciated in the terms of exact sciences and mechanical processes. The war conditions posed all these problems in terms of complicated relationships. The art of production needed not only the coalescence of functional design and production design, not only the perfection of process by choice and

application, not only the co-ordination of many processes to one object in a free sphere of activity, but rather the judicious adjustment of these matters in an ever-changing framework of contending factors such as controlled or restricted supply in a field of unlimited demand, and the overriding and ever-present shortages of men, machines, and material.

Looking back, the Institution may have some satisfaction in the general part it played between the wars, and during the last one, but as this Institution was formed in London and London was in fact the first Section, I ask this Section and myself what course it should set in the next 25 years. In an Institution sense, what progress has been made, what are the benefits and obligations of its members, and should the Institution be an end in itself or should it be continually seeking to serve its day and generation ?

As a body of professional men we can say that we are well organised. Our affairs are managed in the democratic way adopted by most similar bodies ; we have our sections with their Committees ; we have our standing Committees and Council, and we have the administrative officers necessary to carry out the work.

The first and most important duty of the Council is to safeguard membership and maintain its standard. It is their first duty to ensure that only technically qualified and professionally worthy men are admitted to membership. It is the constant endeavour of the Council to make true technical and professional qualifications the criterion of membership. It is of vital importance that members should recognize their own responsibilities in this matter, and seek to bring into the Institution those men who can help to further our objects and not those to whom membership of the Institution would represent merely a personal triumph. Good membership must be mutual recognition : on the part of the individual, recognition of an association able to extend the opportunities for professional service ; and on the part of the Institution, recognition of an individual whose efforts and attainments make him worthy of membership.

Everything which the Institution can or should do depends on its members. We must, on the one hand, stand in such a position of authority and leadership that we shall attract to membership those who by their qualities and either attainments or promise are likely to lend aid to our objects and enhance our authority. On the other hand, we must see to it that the standing of the Institution is not lowered by the admission of men of doubtful background and doubtful attainments.

The progress in this direction has been considerable. It is now some years since the Institution adopted an examination standard for its graduates, and although too few students are taking the course the number is not only increasing, but active co-operation between

the Institution and the Education Authorities is ensuring an increasing appreciation of the importance of adding to the academic ground work required by all engineers, those special subjects which give an orderly basis for the special needs of Production Engineers. Those who have the opportunity of examining the applications for membership as graduates feel warmly encouraged by the high standard of applicant, and there is no room for doubt that the Institution, and indeed industry generally, can look forward with confidence to the coming generation of Production Engineers. That the quality is good is, however, not enough. The number of students taking the course must be increased. The Ministry of Education is not only sympathetic ; it has acknowledged the Institution's efforts and is co-operative. The Education Committee of the Institution has presented a Memorandum on the subject to the Ministry and has given evidence before the Lord Eustace Percy Committee on Technical Education, and our immediate past-President of the Institution, Sir Robert McLean, has addressed the Association of Technical Institutions on the subject. The Ministry of Education awards a Higher National Certificate in Production Engineering, the holders of which are automatically exempt from the graduate examination. In all its endeavours the Institution has allied itself with those who, believing that a good workshop training is as essential as this more academic Higher National Certificate background, have insisted that as far as possible students should be given the opportunity of academic study in with their general training and thus avoid excessive hours of extra night study which some of us may remember, and might even admit, were somewhat of a strain.

The student today who, together with progressive shop training, can achieve the Higher National Certificate with Production Endorsements is worthy by his efforts of the highest prospects in industry and there can be no doubt that industry not only needs, and can reward, such men, but needs them in increasing numbers. The Institution is hoping shortly to extend its work in this sphere and to make even closer its links with those concerned with Technical Education in this country.

For older men the standard must be professional standing and attainments. Great care is taken by the Council and those it delegates in these matters, but in the final analysis the results will depend on the members themselves.

The members who accept the responsibility of proposing or seconding persons for membership must remember that they act in the capacity of trustees, and must exercise care which they would expect of other members. They should satisfy themselves on all the points upon which eventually the Council have to be satisfied, and they should see as far as they are able that all statements are

not only factual, but clear. It may be that in due time the Institution will prescribe other qualifying means for admission where any doubt exists, but in the meantime a special responsibility rests upon members.

So much for the Institution's progress along the road of Education and Membership.

In the practice of the profession it has been prolific in the formation of sections and sub-sections, with the deliberate intention of fostering the fullest opportunity to all members to discuss common problems, and test and prune principles. The size of the London Section may give us access to more technical authorities for our lecture meetings, but certainly it operates against the intimate discussion between members which is possible in most sections, and was indeed one of the outstanding features of the early days of the Institution in London. A study of the proceedings over the last 25 years shows that there is hardly a subject or branch of Production Engineering which has not received at least one authoritative examination. Indeed, the proceedings of the Institution form a most comprehensive library in themselves. The technical attractiveness of our lectures may be viewed from the point that in the present year to date, of the total attendance in the London Section, 30 per cent. were non-member visitors. It is perhaps interesting, too, to note that when we had the address on "The Structure of Management," the attendance was not only the highest, but members then represented 78 per cent. of the total number present.

The Journal reproduces the best of the Institution's various proceedings, and is watched over by the Technical and Publications Committee. They continue to work with the handicap of heavy restrictions as to paper, and notwithstanding this and other problems they carry out an extremely onerous task in a wholly admirable way. This Committee was also responsible during the war for a great deal of far-reaching and important work in the national interest.

The other outstanding achievement in the sphere of practice is the pioneer work in connection with the Production Engineering Research Department. With the great help and encouragement of Lord Nuffield during his Presidency and since, the Institution started its own Research Department. This work, like all pioneer work, found many friends who recognised the efforts being made, and who were prepared to add their contribution. This work was well-developed until it became so well established and so general in its appeal that it needed a broader partnership in order to secure the most fruitful expansion. As members will know, this effort has now become the Production Engineering Research Association of Great Britain, and no doubt will make a most valuable contribution to the production needs of the future.

We can then summarise the achievements of the last 25 years in the following way :—

1. The Institution has become thoroughly established on solid foundations of technical qualifications.
2. It has a strong membership in every industrial centre.
3. It has made its contribution to the advance of technical education as applied to Production Engineering.
4. It has provided a forum for the highest type of lecture and the discussion thereof.
5. It has collected together lectures and proceedings as a record of the most advanced thought on Production matters.
6. It has been the means of sponsoring research which otherwise would not have been commenced for years.
7. Perhaps most important of all, it has made as a corporate body, and individually through its members, an indispensable contribution to the winning of the war.

What now lies ahead ? In my view, membership of this Institution must carry ever-increasing responsibilities.

Taking the achievements of the past as the sign posts to the future, I would summarise our responsibilities thus :—

1. The maintenance of the Institution in a position of real influence and authority.
2. The continuance of efforts in the Eductional and Technical sphere.
3. The sponsoring of every kind of national effort in the interests of production.
4. A proper sense of responsibility as a corporate body, and as individuals, in the vital problems of the nation's efforts to win a share of the peace.

Little need be said in regard to maintaining the Institution in a position of real influence and authority. It is perhaps sufficient to say that it will retain this influence only so long as it is ready and willing to contribute towards the general good. It will not retain a position of influence if it tends to develop along a selfish and partisan line, seeking only its own ends.

Regarding the continuation of its efforts in the Educational and Technical sphere, as I have already said there is considerable promise that the Institution's influence in this direction will be even further increased in the near future. There is, however, an additional responsibility in this direction which members must accept. This responsibility consists of seeing that every senior member plays his part in the work of the Institution, and makes his contribution toward passing on to our students and graduates the experience and opportunities for gaining that experience which is so essential.

The position of the graduates in London is particularly difficult, and there has been in the past too little positive help given to the graduate section by the senior section. Whilst it is important that graduate sections should be left to run their concerns as they think best, I hope they understand that any help which can be given from the senior section will be readily available. I hope, too, that senior members will lose no opportunity of exercising their influence in any sphere, so that students or graduates may have the most favourable opportunities of following their studies in parallel with the acquisition of thoroughly sound practical experience.

Members can also play an important part by extending such co-operation as they can from their firms, with local Technical Schools, and by providing opportunities for Technical Students to see industry at work so that they may appreciate the importance of engineers directing and controlling production.

The Institution's standing in the national sense is already established, it needs to be sustained by active sponsoring of general efforts in the interests of production. In my view, the Institution has performed an excellent piece of work in its efforts with the Research Department, but I suggest that apart from the work itself the effort sets a pattern of the way in which the Institution should seek to influence matters of this kind. As in this case, the Institution should continue to set desirable objects in motion and when their object has become sufficiently widely established and they become too big for the Institution permanently to operate, then the Institution should find a foster parent to continue the work on the scale necessary as it has done with Production Engineering Research. In short, let the Institution do the work of initiation, and having got things started hand over to other bodies to keep going.

I believe, too, that the experience and assistance of members might, for instance, be used in order to carry out research into other matters concerned with production, perhaps especially on the administrative side. I have no doubt all members are familiar with the operation of Research Groups in management and other spheres. I question whether there exists a body more qualified to carry out research into some of the less concrete aspects of production today than this Institution.

As the Institution performed its part in the war, so I suggest it must play its part in the peace. That this country has to recapture its leadership in matters of engineering and the sphere of production is well established among all thinking men, neither is there any doubt that the task is not likely to be achieved unless those most experienced are chosen to lead and, let it be added, those willing to lead.

It is an accepted fact that Institutions of this kind should avoid, like the plague, any excursions into the realms of party politics.

It must scrupulously avoid any political bias. It must recognise, however, its responsibility so to enunciate principles and so to expose facts that good policies will be formed, and it must at all costs avoid failure to play its part because of an unwillingness to interest itself in the highest form of politics, that is, the welfare of society. This Institution and its members have a vital and indispensable part to play in the peace-time industrial recovery of this country. It cannot play this part unless it determines to face the problems of the day and trace out from its experience the proper solutions. Production is the one certain key to recovery and not only recovery, but progress.

We must see that those mysteries with which so many would like to surround the facts are shorn away, so that all engaged in this noble art may appreciate the benefits of true co-operation and the interdependence of all branches of industry. No matter which party may be in Government, the principles of good Production Engineering remain. It is our duty to express them clearly, and to uphold them co st ntly.

"THE STRUCTURE OF MANAGEMENT"

by G. CHELIOTI.

Presented to the Institution of Production Engineers, London Section, January 2nd, 1947.

I have to thank you very much for your welcome, and perhaps I should be on the safe side if I were to apologise for my choice of a somewhat dull subject. I believe that I have been billed to speak on "The Structure of Management," but I should like to generalise that title and say that I am going to speak about the structure of organisation in general.

There are two sides to organisation. First, there is what may be called the static side. That is not a very well chosen word, but I use it in opposition to organisation in action, which is the dynamic side of it. Many of you will be familiar with the classical work of Mary Parker Follett, which she calls "Dynamic Administration." It was from there that I stole the term; it had never occurred to me before to regard administration as dynamic, as against the purely structural aspects of organisation.

Tonight I do not know where our questions are going to lead us, but I shall confine myself to what seem to me to be the basic principles of arranging the relationship of persons in what I have called the structure of management, one of those types of arrangements which you can see presented in charts and which you can yourselves represent on charts. I do not think that there is such a thing as an international code, or even a national code, of signs and symbols in drawing organisation charts. I would much rather that there were, but most of us have to invent our own ways of drawing these charts. If, therefore, my own methods are not the same as yours, I hope that we shall not quarrel on that account.

Introduction and Definitions.

Organisation is such a wide term that its sense as it will be used in this paper had better be defined. The O.E.D. gives "systematic arrangement for a definite purpose" as a use established in 1790, which date, coinciding with the dawn of the industrial revolution, is very apt. The "definite purpose" for us is the production of useful goods and services, and the "systematic arrangement" which we are to consider is of human activities directed to that end. Things as well as people must be organised, but the people are infinitely the more important; if we arrange their functions and relations properly, they in their turn will look after the things.

It is a fascinating study, and not at all difficult. If you begin to think about the fundamentals of these things, you will find that it is easy to satisfy yourself why it is that mankind invented this difficult art of organisation. It is a response to a definite need which he has felt ; so much is quite clear. The roots of the need for organisation lie clearly in the fact that the human species won its biological success by its capacity for common effort.

I know that various reasons have been given for the fact that mankind won the evolutionary battle. It has been said that the habit of walking erect was very important, and that the capacity for intelligible speech played its part, and that the fact of having a pair of hands with opposable thumbs, making it possible to hold tools, was also important. Those were all steps, undoubtedly, in the evolution of man, but what really differentiates man from the other animals is his capacity for common effort. I intend that to exclude the social insects, because they work by instinct only, and we work by what we are pleased to call reason. It is not always easy to recognise our efforts as inspired by reason, but that is what is supposed to prompt them.

Man has developed this capacity for common effort through the ages by an increasing control over the forces of nature, and by his adoption of the principle of division of labour, or specialisation of function.

If he had not discovered this principle of the division or specialisation of effort, I should imagine that we would all be members of an extremely primitive species in which each man caught his own food, built his own house, made his own fire, and so on. We have got away from that, but one of the biggest flies in the ointment is that mankind has unfortunately discovered that this habit is magnificiently adaptable to his other habit of warfare, and that his most thoroughgoing demonstrations of his collective abilities have so far been applied to destruction, but while we await his reformation we have still to study his—which means our own—behaviour and the means of controlling it.

This contradictory creature, however, besides his ability to combine—which after all he shares with the ant—has the complementary and much greater virtue of personal individuality, without which he might just as well have stayed among the simpler orders of creation.

By developing this capacity for common effort, while at the same time going a tremendously long way towards developing an aggressive individuality, we have set a tremendous problem for the organisers of human affairs ; how to turn a potential mob of individuals into a team whose members will work towards a common end—a problem of leadership made harder by the fact that any but the simplest organisation must have not one but many leaders, whose co-ordination will be supremely important but who, being

chosen for their abilities, are likely to be more than usually individualistic in their characters. Be it noted that the totalitarian solution for a similar but larger difficulty is to vest all authority in the State (" l'état c'est moi " murmurs the Dictator to himself), and to suppress all individuality which is in the least degree inconvenient, but that method at any rate is unavailable to the industrialist in a democratic country, even if he be so foolish as to hanker after it. He must seek instead to set up in his field of administration, large or small, such a system of relations among the human units whose work he has to guide and co-ordinate as will enable each to understand his duties and to carry them out with the least possible friction.

In what follows we shall have to consider the nature of authority, of delegation and of responsibility, and it will be well to define the senses in which these words will be used. " Authority " is thus defined in the O.E.D. ; it is derived from " author," which means " a person who originates or gives existence to anything." Authority is therefore, for us, the quality which flows from that which gives existence to whatever organisational structure we may be considering, and the dictionary gives us these (among other) definitions of its meaning ; " power or right to enforce obedience " ; " the right to command or give an ultimate decision " ; " power to influence the conduct and actions of others " ; and " derived or delegated power." Of those, the first cannot apply to free men, upon whom obedience cannot be " enforced."

Everybody in this room will agree that merely enforced obedience brings us down to the slave level and is of no use at all in the kind of organisation which we are trying to create to run industry. The second definition comes a little nearer, but we must remember that the " right to command," if it is to endure satisfactorily, must depend upon the acceptance of the commands by those who are commanded. Failing that, of course, the commander and the commanded will eventually have to part company, or somebody will have to part them. Authority in industry, subject to the law, is undoubtedly capable of reaching ultimate decisions on a great number of subjects. The third seems to hit the target ; the successful administrator in industry is he who uses his power to " influence " rather than to " enforce " or " command " conduct and actions in those responsible to him.

The fourth meaning is essential to the basic concept of organisation ; the most able leader must have his lieutenants and the authority which he exercises is broken down and distributed through them, and so on, stage by stage, to the humblest levels.

" Delegation " is best defined in the O.E.D. as " the action of entrusting or committing (authority) to another as an agent or deputy." A person who thus receives a fraction of entrusted authority is said to " derive " it from the delegator.

" Responsibility " is given as " the state or fact of being answerable or accountable (to another for something) ; liable to be called to account," and again, " the state of being capable of fulfilling an obligation or trust."

Underlying Principles.

Since the problem of the organiser is to systematise the relations of a group of human beings in some common effort, we are from the beginning among intangibles ; the philosopher and the psychologist are entitled to widely varying views, assuming anything from anarchy (which unquestionably would be not only the easiest all-round but also the most efficient, if men were perfect in their behaviour to one another) to hypnotism as the best foundation on which to build.

Actually the renowned dictators did rely to a very large extent on something which came very near to hypnotism ; both Hitler and Mussolini did that. On the other hand, I have mentioned anarchy, and I ought to say that " anarchy " has taken on in the English language a number of meanings which it ought not to have at all. At the beginning of this century, an anarchist in the public mind was a man who threw bombs on the slightest provocation. That, however, is not the real meaning of the word ; it simply means the state of having no authority or no rule. The theory of the people who propounded in the first place the idea of anarchy was that if men were trusted to behave properly they would not need any kind of rule, because their own intuitions would lead them to behave in the most perfect manner. It is an attractive theory, but men are just not built that way. It might be very fascinating to roam in that field of speculation, but as practical people, we must start from fundamental assumptions based on our ways of living and see where logic can take us from there.

As has been said above (and long ago and much better elsewhere) government of any but slaves must depend ultimately upon the consent—or at least the tolerance—of the governed. Hence the first principle to be applied is that all successful direction of human activity must depend upon the obedience of those who are directed ; their obedience can be secured only by their goodwill or by their fear of the consequences of disobedience. Since there can be no comparison between the value of the two motives, the first must be fostered at all levels, but the higher the individual stands in the structure of authority, the more important it will be that he (which naturally includes " she ") should understand *and accept* the relationships which exist between himself and those with whom he has to work.

The second principle, which follows logically from the first, is

that he must know clearly for what, and for whose work, he is responsible, and to whom. He should know also to whom his own immediate superior is in his turn responsible, and indeed the more clearly he grasps the entire structure of the industry in which he works, the more able and likely (assuming the structure to be rational) he will be to act intelligently and vigorously as part of it.

It is impossible to over-emphasise the importance of that. We hear a great deal about the frustration of the ordinary working man or woman, who is turning a small part or drilling a small hole, or doing some other apparently unimportant function, and who does not know what the part is for, or anything about it. There has been a great deal of publicity on that aspect of industrial relations, and it is perfectly legitimate ; but not nearly enough has been said about the people much higher up in the hierarchy who have not the foggiest idea of the nature of the organisation in which they work, and of the way in which they fit into the scheme. The wise executive will avoid like the plague the " little tin god " attitude, now happily obsolescent, and make it clear that he is himself only another link in the chain, since the instinctive distrust which we feel for any state of human affairs which seems to leave any man in a position of irresponsible power is rooted in the very foundations of political wisdom.

If you look back over the history of this country, or the history of America or of any democratic State, you will find a profound human distrust of the extreme concentration of power in the hands of any one person. It has been an unfortunate fact in my experience, and I suspect in the whole history of industrial development in this country, that there have been too many small dictators or would-be dictators who have flourished in British industry, and who have taken rather a pride in trying to appear as little tin gods who are responsible to nobody, whereas if they were wise they would make it as clear as possible to those whom they lead that they themselves are only links in a chain, and are responsible to somebody else. After all, even the most autocratic managing director is responsible to his shareholders, though he does not, I admit, always talk that way !

Even this most tolerant of nations beheaded the last of its kings who disclaimed responsibility to any earthly power, even though it set up a statue to him after adequate reflection. That, however, was no consolation to the king, and it will be no consolation to the industrial dictator who is unseated in the present and honoured in the future.

But our present concern is with the structural principle. We must firmly remember, however, that this desirable consciousness of the continuity of the structure of authority must never be allowed to degenerate into that " passing of the buck " to which our frail

human nature so easily gives way. It is fatally easy to blame "the man higher up," instead of justifying our own instructions or refusals.

The fact is that any group of people who enjoy or suffer various graduations of authority should be working on a common policy, and if there is anybody of any importance in that structure who is so little in sympathy with that policy that he finds himself constantly having to justify his own actions, or the things for which he is responsible, by saying "It is the bloke upstairs who told me to do it," he is so far out of sympathy that he should not be in his job.

I have given as one principle that the obedience of the people who work in an industrial structure must depend on their acceptance of the authority of those higher up, which really means the acceptance of policy. You cannot respect the authority of people who are trying to impose on you a policy which you believe to be fundamentally wrong in some way or other. My second principle, therefore, is that people should be made to realise their place in the structure of authority.

The third principle, again logically derived from the first two, is that authority and responsibility should be indivisible. No man should be asked to carry responsibility unless he be given the corresponding authority. It is no use trying to make Tom responsible for the actions of Dick and Harry unless he has the authority to tell Dick and Harry what they ought to do. It is as simple as that. Conversely, he must be given no authority unless he be held fully responsible for his actions in the exercise of it.

The fourth principle, still flowing from the others, is that the branching and intersecting channels of authority (and therefore of responsibility) must be single and unbroken from the highest to the lowest levels in the organisation. No man should be exposed to the risk of conflicting instructions, nor should he be asked to share with another the duty of instructing his subordinates. Occasional exceptions where apparently this principle is harmlessly ignored do not usually stand up to investigation, or, if they do, the explanation is found to lie in a happy conjunction of personalities which, since men are not angels, cannot reliably be contrived as a general practice.

The fifth principle, which depends mainly on the third and is related to the fourth, governs delegation. To be effective, delegation must be real. The senior who delegates authority to a junior executive does not part with it. He does not part with the responsibility, and not parting with it, does not part with authority.

You can appoint a delegate to carry part of your responsibility and give him authority to deal with the matter, but you are not justified thereafter in saying, if anything goes wrong, "That is not my fault—Bill did it." Having delegated some of your authority

to Bill, you are still responsible for what Bill does. The junior is still expected to carry out loyally the policies or the specific instructions which his senior originates or passes on from a still higher level, but the junior has the right to expect that he shall be allowed otherwise to do things "in his own way" (indeed he would be unsuited to his post if he were not fit to do so), and above all that he shall be the channel through which authority and instructions are transmitted to his own juniors. This may appear at first sight to be an operational rather than a structural principle, but its abuse is at least as likely to arise out of a bad or ill-defined structure as from any other cause.

An organisation with these principles will be one which holds the possibility of smooth and effective working; one which departs seriously from them will almost certainly suffer ills which may range from slight and constant friction up to high calamity. Their restatement may seem to some to be platitudinous, but it is justified by a neglect of them in some industrial undertakings, due either to ignorance or to defiance, which is almost incredible. We may perhaps hope some day to get education for management developed to such a stage that our executives will know as much about the anatomy of organisation as the young doctor is expected to know about that of the human leg before he attempts to set a broken one, let alone create a new one.

Delegation.

The last section implies that a group of people, whether it comprise a whole nation or only the workers in a tiny factory, hoping jointly to accomplish something, needs leadership, the necessary authority for which must be somehow created and vested in some person, be he Prime Minister or darts team captain. In industry as we know it, authority is created most usually by the association of a number of shareholders, who invest in the means of production and elect directors to act for them. The directors in turn vest (or should vest) their authority in a managing director or other manager who so becomes the chief executive, with the duty of carrying out directly and through his subordinates, the policy and instructions of his directors.

The subject of delegation can usefully be explored further at this stage. In the hierarchy of a particular firm or company, it is easy to comprehend the delegation of authority downwards from the managing director to a number of departmental managers, and then successively to superintendents, foremen and charge-hands, or to heads of office departments, and thence to senior and junior clerks. It is evident, however, that the authority exercised by a managing director is of a special kind. Those who fill the other offices just

mentioned recognisably derive their authority from a higher executive ; the managing director alone seems to stand isolated—there is no higher executive officer.

The reason will be found in the articles of association of the particular company and in the current legislation generally governing the operation of limited companies. A managing director (or if there is none, a general or principal manager) is appointed by, and therefore derives his authority from, the Board of Directors which every company is bound by Statute to maintain. These directors are appointed in turn by the shareholders, who are the ultimate source of authority throughout the undertaking. The managing director is thus a focus or bottle-neck through which the stream of authority flows, having converged from the shareholders towards the managing director and diverged from him through the executives. To take a larger parallel by way of reminder that the principles of organisation are really constant throughout human affairs, the authority for government in our democratic country is derived from the people and converges from them through their elected members of Parliament to the Prime Minister (who, since he is normally the leader of the strongest party in the House, is in effect the choice of the majority) and from him it diverges again through the members of his Cabinet and the permanent heads of the Civil Service to the whole body of the Civil Service.

This brief explanation, though true in essence, is of course incomplete and over-simplified. In particular, the constitutional position of the Crown is neglected. The King " sends for " and apparently appoints the Prime Minister, but does so, in fact, only on the advice of the Commons as conveyed to him by the retiring Prime Minister. Also, the doctrine of collective responsibility of the Cabinet, though it does not make Ministers individually responsible for their actions to the House of Commons (which does not appoint them individually) does tie them together, so that apart from the reconstructions which a Prime Minister may bring about in his own Cabinet by internal agreement, an individual minister cannot be forcibly removed by the will of the House without the overthrow of the entire Government. Moreover, the Law holds an overriding and impersonal authority. Its individual judges are, like ministers, appointed by the temporary authority of the government of the day but they are appointed for life, and the legal code which they administer embodies an accumulated authority of the centuries which contemporary Government can change only with great difficulty by any constitutional process.

Once you become thoroughly interested in the machinery of government, you will find that it is an intensely fascinating subject, and more particularly this question of the rule of law, which has a continuous existence quite independent of living men. It is only

at a time of supreme social unrest and successful revolution that the rule of law is ever thoroughly upset, and when that does happen, the state of affairs which is created is always extremely inconvenient.

I think it is right to say that in Europe the first example of a complete overthrow of the rule of law was that which took place at the end of the eighteenth century in France, and we all know how very uncomfortable the results of that were. France has had two or three constitutions since then, and indeed, has been very busy constitution-making in our own time; but France, though so unstable in her machinery of government and so changeable in the structure of her machinery of government, does seem since the time of the French Revolution, on the whole to have kept the rule of law going continuously. I am afraid, however, that that is merely another digression.

There can be no question about the essential similarity of the accumulation and distribution of authority. It is naturally to be understood in both cases that the principle of the co-existence of responsibility with authority at all stages is maintained, with the exception that convergent authority is relatively difficult to exercise, and is in some cases only theoretically accompanied by responsibility.

For instance, the collective responsibility of the voters or shareholders for, and their authority over, the Governments or Boards they put in office is clear, but it is easier to quote cynically that "a people gets the government it deserves," than to tell a body of shareholders constructively how they are to find a satisfactory board of directors or managing director if they are presently unfortunate. In short, it can be said that both authority and responsibility, whether convergent or divergent, rapidly become more tenuous as we get further from the focal point.

It is interesting to note that the democratic method of government is so called because it results in the convergent delegation of authority by the people to a focal point, whence it diverges again through the administrative services, and results in the government of the people themselves, in the closed circle implied in Abraham Lincoln's phrase "Government of the People, by the People, for the People."

A further need is to clear our minds on what is rather clumsily called "functionalism" or "functionalisation" in management. The O.E.D. gives us no help; it does not appear yet to have heard of this particular piece of jargon and there is, unfortunately, no alternative without the invention of still another piece of jargon. Naturally, every person in an organisation should have a clearly marked function, whether it be as managing director or gate-boy. Most chains of delegation of function are clearly direct, e.g. in a simple structure, a managing director directs the works manager and so in turn the shop superintendent, the foreman, the charge-

hand, and the manual worker, and the function in that chain is the production of goods.

Such straight (or if you prefer it, radiating) lines are, however, in the typical large modern organisation, intersected by other lines of authority. For example, our managing director may also direct a commercial manager and he in turn a purchasing officer, and so on through the clerks, stores-men, and the labourers who eventually issue stores to the shop superintendent or foreman, or even the manual worker, thus intersecting at one or more points with each direct chain of production. We may be able to trace a third chain in the same organisation, from the managing director to the chief engineer, chief inspector and sub-inspectors, which interlocks with several manufacturing departments. These intersecting or interlocking services, arbitrarily called functional, have the common property that though they ultimately derive authority from, and owe responsibility to, the same focal point in the organisation as controls the main purpose of production, the things they provide are only feeds or services of one kind or another which are needed for that main purpose.

To cite a very rough parallel from daily life, the relationship between the departmental superintendent and those who are carrying out "functional" services in his department is essentially similar to that between the householder and the doctor or plumber who comes to do for him something at which he is a specialist and the householder is not.

In any self-contained industrial organisation, the hall-mark of the "functional" department is that, with responsibility to some executive authority within the same organisation, it carries out specialised duties in two or more other departments without coming under the authority of (or being responsible to) the immediate heads of those departments.

Limits of Co-ordination.

One other feature of organisation which is not so easily reduced to a basic principle as the others which have been discussed, is that no man should undertake to direct and co-ordinate the work of more than a limited number of assistants. This is because in an organisation in which complex duties are carried out by a number of people towards a common end, co-ordination is as important as direction, and the task of co-ordination increases much more than proportionately to the number of assistants, if the work of those assistants is interwoven. In other words, it is a human limitation that none of us can undertake to transmit authority through more than a strictly limited number of separate channels.

The invaluable O.E.D. gives for "co-ordinate": "to act in

combined order for the production of a particular result," which is nearly enough the sense in which the word is here used. Management, to be complete, involves, besides the laying down or exposition of a policy and the separate direction of subordinates, the conscious effort to ensure that they will play their several parts in harmony. This subject is a considerable one and has been discussed in great detail by several authorities. Its physical and psychological foundations are obvious but hard to define ; it can, however, be put into a mathematical nutshell by the observation that the number of " direct group relationships " which can exist among a chief and four subordinates is 15 ; increase the number of subordinates to six, and the number jumps to 61. In practice, many or most of these relationships may be unimportant and to the extent to which this is true in any particular case, the capacity of the chief is extensible ; for example, commercial travellers, each operating in his own area, would be a very easy case.

One chief salesman or sales manager can direct the work of quite a number of commercial travellers, because the job of the commercial traveller is a very individual one and he does not usually cross the path of any other people in the organisation. He needs no co-ordination, but only a policy, a price list, a routine, and a route to follow.

It would not be appropriate in a short paper to go deeply into this subject, but it may be remarked that though no rigid rule can be laid down, there are very weighty opinions to the effect that in the case of subordinates carrying varied, complex and inter-related responsibilities, the limit should be sometimes as low as three and seldom higher than five. It is obviously far easier to guide the work of a dozen salesmen, each ploughing his lonely furrow, than that of four men acting as works, sales, technical, and personnel managers, who daily have to settle minor matters privately to their common satisfaction, and who must frequently refer to their managing director matters on which his opinion and casting vote are essential.

Conclusion.

This last consideration brings us very close to the borders of the other branch of our subject ; organisation in action or, as it has been termed, " dynamic administration," and this first section may conclude with the reminder that though certain *principles* seem to be fundamental in the successful organisation of human effort, and may be ignored only at our peril, they may be translated into a great variety of methods which may differ widely in detail, yet be severally well adapted to particular ends.

In the field of industry it would not even be true to say that

having defined the size and objects of an undertaking, one could then rigidly specify in detail the organisational structure which would best fit its needs, for that would be to leave out the vastly important question of the characters and capacities of the individuals available to fit into the executive positions. Organisation in practice has to be built very much in accordance with the material at hand, and human beings must be regarded for this purpose as more like the pieces of a jig-saw puzzle than as bricks to be fitted into a geometrical form.

Summary.

Some terms are defined, and it is suggested that the following principles are applicable to organisation for industry as well as for most other human activities.

(1) Obedience must depend upon acceptance of a relationship.
(2) Acceptance of those who obey should rest upon their understanding of their places in, and of the objects of, the organisation.
(3) Authority to require obedience, and responsibility for the results, must be indivisible.
(4) There must be no duplication of authority.
(5) Delegation must be real. (Imperfect delegation means responsibility without sufficient authority.)
(6) No person in a position of authority can, at first hand, effectively direct and co-ordinate the activities of more than a strictly limited number of subordinates, the limit depending on the complexity of their inter-relationships and the degree of responsibility which they severally carry.

The nature of delegation of authority has been discussed ; it has been pointed out that some of the delegated authority is used "functionally." Finally, it has been stressed that organisational method depends on human nature and that since all organisations are made for man and not *vice versa*, they must be adaptable to his individual characteristics.

DISCUSSION.

Mr. WHITE said he would like to tempt Mr. Chelioti to say a few words on what was an extension of his subject. As a result of specialisation trends in management, there was at the workshop level a continual increase of the specialised repetition operation, with the accompanying problem of monotony. That seemed to be a necessary trend, particularly with the present need for high productivity and therefore for high specialisation. Many people, not only in management but among the workers themselves, had

said that monotonous and specialised work of that character was very much liked by the workers. In his own experience that was often true, but he wondered whether from the larger point of view that inevitable trend of present-day specialisation in management was desirable from a social point of view, and whether Mr. Chelioti would like to express any views on what was the right social solution of the problem.

Mr. CHELIOTI said that the question was of great interest. He thought that Mr. White was drawing a parallel between the monotony of the specialised manual operation and specialisation in management itself.

Mr. WHITE observed that both were problems which followed logically from specialisation.

Mr. CHELIOTI, referring first to specialisation on the shop floor, said that this was an inevitable development, and it would be presumptuous on his part to tell the Institution of Production Engineers what were the reasons for it. It was due to the increasing complexity and specialisation of the tools and machines themselves, so that the people who looked after those tools and machines were bound to experience a certain monotony in their use. His own experience, however, agreed with that of Mr. White, in that there were large numbers of people who did not mind that particular type of monotony. That was especially noticeable among women; there were very large numbers of women workers who did not like being displaced from one job to another. On the other hand, there was a definite type which cropped up now and again among the women, a type of woman who became tired of an operation and either asked to be taken off that operation or left the firm altogether. If such a woman left, the firm would probably be losing a very valuable person, because in his experience the type of woman who was a very good operator and who mastered a job quickly and did it well but then wanted a change would be a very good type to train for promotion. He felt that Mr. White would agree with that.

So far as management was concerned, he was not sure what type of specialisation Mr. White had in mind. Personally, he did not consider personnel management a branch which should lead to monotony.

Mr. WHITE remarked that he had not had in mind the question of specialisation in management functions; he had been endeavouring to tempt Mr. Chelioti from his proper beat to deal with the question of specialisation and monotony in jobs at the factory floor level.

Mr. CHELIOTI agreed that this was a very real problem. We were, he pointed out, rapidly extending popular education and the length of time for which young people remained at school, and that meant that a bigger proportion of the population than ever before

would have its intelligence and curiosity awakened to a higher degree than in the past, so that one might expect to find a higher proportion of impatient people, impatient in the sense that they resented monotony.

He did not think, however, that the alteration in the proportion of that type was going to be so great as might be expected. He remembered joining in a discussion at a meeting on training in industry at which one or two old die-hards took the line: "If we are going to encourage all these young people to improve their education after they go to work, and if we are going to ask them to attend technical classes and improve their mental equipment, who is going to do the hard work?" There would always be, however, something like a majority of people who were mediocre as far as their original issue of intelligence when they were born was concerned, and he thought that our modern, complex societies, if they were reasonably organised and reasonably run, could make use of all the mental quality which they could develop.

In the other direction a good deal was being done to safeguard the individual against the impact of monotony by shortening working hours. When he was a boy, the ordinary starting time in factories was still six o'clock in the morning, and the ordinary working hours were anything from 55 to 60. Monotony was much worse in those days than it was at present.

Admittedly that was not a complete answer. The philosopher could easily tempt people to the conclusion that society was on the wrong track altogether, and that we ought to have remained at a much simpler level of civilisation with much less specialisation of functions, and that when we began to move away from, say, the feudal level we were sowing the seeds of our present discontents. On the other hand, for good or ill, mankind was launched on this perilous progress, and production engineers had to make what they could of the mechanical civilisation into which they had been born. The modern, enlightened manager had a great deal of intellectual sympathy with this idea of monotony in industry, and with enlightenment on the part of managers and supervisory people in general it should be possible to mitigate this monotony a good deal. He was afraid that all that could be done was to devise palliatives.

MR. PRATT asked the author to imagine a little diagram in which the lines of authority from the centralised board of directors and chairman were carried first upwards and then round and downwards, forming two circles. That would give an organisation, he said, rather akin to the present nationalised industries, and also very much akin to the factories and industries where the shareholders were the actual workers themselves.

Having done that, he would like the author to say where the true line and source of control and direction occurred. He could not

help thinking that in a case of that kind the true control and direction came not from the shareholders (who were now translated into the workers, or, in the case of nationalisation, into the voters) but from the centralised centre section. The influence was far greater than could possibly be wielded by the shareholders, now termed workers, or *vice versa*.

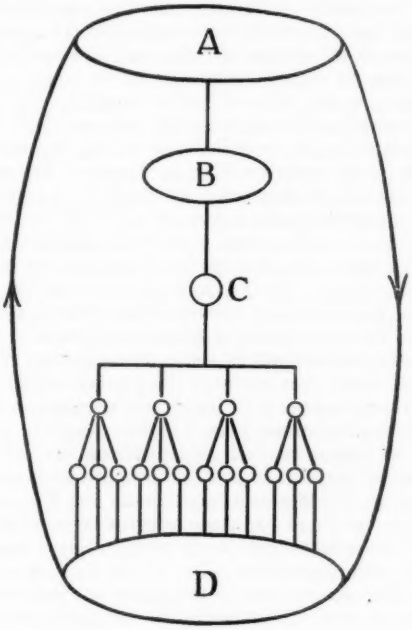

FIG.1.

MR. CHELIOTI said that that was on the lines of James Burnham in his book "The Managerial Revolution", and that there was a great deal in what Mr. Pratt said. If he drew the sausage marked A to represent the shareholders (Fig. 1), the shareholders delegated their authority to a smaller sausage, B, the board of directors, and the board of directors appointed a managing director, C, who was the focus and concentration of authority. He would then suppose that the managing director chose four managers, indicated by the small circles, for the various functions of the undertaking, and those managers in turn had their immediate subordinates—they must be

imagined as having many more blobs than were shown in the sketch. Eventually this authority went down to the lowest level and acted on another sausage, D, the rank and file of the workers. Now, if the contents of the lower sausage, D, were the same as the contents of the upper sausage, A, one would have a co-operative organisation in which everybody was both worker and proprietor.

There was no doubt at all that that concentration of authority was a very real one. If one could imagine society consisting entirely of co-operative closed circles of that kind, it would not completely explain the state of society ; there must be some overriding and co-ordinating authority, otherwise there would be a number of small closed circles with hardly any contact between them at all.

For the purpose of the present part of his argument, he would assume them to be mainly different people. There was no big company whose shareholders did not include a smattering of the workers in that company and a number of people in the intermediate layers, but it was obvious that one of the things which governed this particular system and all other like systems, and which therefore bound them together to some extent, was the law, because the law, with its special provisions for the operation of companies, and with its commercial law provisions in general, did restrict the liberty of the organisations in question to act in any way they liked. In these days, moreover, there was not only the passive aspect of the operation of law ; there had been an increasing encroachment of government for some generations now on the complete liberty of the industrialist, by means of factory legislation as well as company legislation, and during the war, of course, by an immense body of special legislation, for the most part under the Emergency Powers Act. Since the war there had been various Acts of nationalisation and national planning which were increasingly bringing industry at large under centralised authority. There was no such thing any longer as a completely free undertaking in industry. He felt, however, that he had not completely answered the question put to him.

MR. PRATT said he could not help thinking that with the increasing tendency towards organisations of the type shown in the diagram, both in industry and as regards the government of nations, the present and usually conceived systems of management control would fall to the ground, and an entirely new structure would be created.

MR. CHELIOTI asked whether that was so in fact. Admittedly, he said, it was largely a philosophical and political question, and he did not know any absolute values in the matter, but he wondered whether, in fact, any great alteration in management structure and management function was involved. Taking the diagram which he had drawn, if one substituted a Government department for the

board of directors and substituted the State for the shareholders, then in a State-owned industry, such as the mines had now become, the State was the owner, and the authority would vest in the Government department, which in the case of the mines was the Ministry of Fuel and Power. The Ministry of Fuel and Power would not, in fact, directly appoint a managing director of a colliery or group of collieries, but the managing director of a particular colliery or group of collieries would derive his authority from the Ministry of Fuel and Power and, through the Ministry of Fuel and Power, from the State. The machinery of Coal Boards and Regional Boards was quite incidental. The fact that the managing director's power might be more circumscribed, and that he might be more bound by directives from the Ministry, did not really alter the situation, and for all practical purposes the authority below him would be distributed in much the same way. Probably his authority would not be so absolute as before, and it might be that his subordinates would have a more easily exercised and more effective power of appeal than before if they did not agree with the rulings of the managing director ; they would probably be able to go past him and get a hearing at some higher level ; but essentially, for all ordinary purposes, he suggested that the position of that managing director would be much the same in day-to-day affairs as it was when he was responsible only to some remote shareholders.

MR. PRATT expressed the view that when the control, which originally came from above and passed downstairs, took a circuitous route, as in the case of nationalisation or worker-shareholder control, the control, in fact, became largely mythical, and the real control and direction was to be found at the focal point, which was represented in the diagram.

MR. CHELIOTI said he understood Mr. Pratt to be agreeing with him and to be going even further than he did. Mr. Pratt seemed inclined to say that the authority of the managing director would, in fact, even be strengthened under the new arrangement.

MR. PRATT agreed that that was his view.

MR. CHELIOTI expressed some doubt on the matter. It was something, he said, which would have to be proved or disproved by experience. Taking the position of the permanent chiefs of already nationalised undertakings such as the Post Office, could it be said that the Engineer-in-Chief of the Post Office was a man whose authority was more individual and less open to question than that of a man of similar standing in a privately owned concern ? Personally, he would not have thought so.

MR. PRATT pointed out that in the paper Mr. Chelioti had said that control came from upstairs and passed downstairs to the weaker members. With operator-shareholders or a nationalised industry the weaker members were, theoretically at least, at the

top, and therefore the control would be strongest at the focal point.

MR. CHELIOTI admitted that this was a point of view which could be argued, but confessed that he was a little taken aback by it. He would have thought that the feeling of most managers was that they were going to lose rather than gain in authority by becoming nationalised. Personally, he did not think that there would be a sweeping change. Nothing was likely to happen resembling what had been visualised by some of the miners. When the announcement was first made that the collieries were going to be nationalised, some of the more simple miners imagined that it meant that the managing director of the colliery would in future be responsible to the body of the pitmen, which was rather a syndicalist idea than nationalisation.

It would be the experience of many production engineers that when joint production committees were set up some years ago on a large scale in British engineering—a movement, by the way, which he thoroughly approved ; he believed it had been useful—it did not work at all in the way which some of the more simple-minded workers thought. They thought it meant that the shop stewards were going to take charge of the factories—and in one or two cases they came very near to doing it. That, however, was not, of course, the intention of the scheme ; the idea of the scheme was not that shop stewards were men of peculiar gifts and more suited than managers to run the undertaking ; it was because the management was weak and did not understand the purport of the scheme or maintain its position.

MR. KERR referred to the question of the personnel manager, who in some factories, he said, was a most important person, while in others he might as well not be there. It would be of interest if Mr. Chelioti would say where in the structure of management of an enlightened factory the personnel manager ought to come in. Personally, speaking as an engineer, he thought that the personnel manager was as important as any man in the whole organisation, because very often in addition to the problems of personnel he was concerned indirectly with problems of production.

MR. CHELIOTI replied that the question was a very interesting one, and one to which he had devoted a whole paper not long ago when talking to the Industrial Welfare Society at their last conference at Oxford. The institution of personnel management had caused almost as much controversy in industrial circles as anything that had happened in his own lifetime in industry. The present question had been so carefully framed that he could not tell from it whether the speaker approved of personnel managers or not, or whether, indeed, the speaker was a personnel manager himself. Personally, he thought that there ought to be no serious problem if the management that appointed the personnel manager had a clear idea of what

they were after and had a clear idea of the delegation of functions, and if they took the trouble to educate the people who were going to accept the services of the personnel manager to an understanding of what was involved.

Personnel management was only a particular case of the delegation of a specialised function. Everyone present had probably had experience of personnel management and of personnel managers. What had called personnel managers into existence was the realisation that of all the things that an industrial management used for the accomplishment of its purpose of producing goods and services, much the most important was the human being himself. Production managers and designers and works managers, and all the other various functionaries in industry, were apt to be so concentrated on the main business of producing the goods as to be a little impatient of human frailty. When that came to be realised—and a good deal of the stimulus came from the other end, when the organisation of the workers became so good that they were able to resent it very vocally when they were "pushed around" too much—it was seen that managements should try to delegate separately the function of looking after the interests of the workers to somebody who had not any other responsibility to distract him.

That was a very excellent ideal, but the execution of it led to a great deal of friction in industry, and he himself had had the job of "selling" the whole idea of personnel management, and even of "selling" some individual personnel managers, to existing factory management who sometimes had old-fashioned ideas and did not like to try anything new. He was glad to say that he did not know of any single instance where personnel managements had been introduced into an establishment and where as a result of experience it had not been welcomed by both sides. That assumed, of course, that a reasonably good personnel manager had been appointed, either a man or a woman. He did not think that sex mattered very much, and it did not depend even on the sex of the people employed necessarily. Given a good personnel manager, he did not know of a single exception to the general statement that after at most a year, both the management and the workers were very glad that personnel management had been introduced.

Personnel management was, of course, a very difficult subject to define, so that when it was introduced into an existing institution it was necessary to be careful about the authority which was delegated to the personnel management branch. The crux of the whole matter was that the people who were going to be served—both the workers and the management—by a new branch of this kind had to be very carefully educated to the fact that this was a service which was being given to them. The personnel manager must have the idea that he was there to serve the industry, not only the workers

but the management. The personnel manager who tackled his job on the lines of voicing the complaints and looking after the troubles of the workers and doing nothing else would merely be an educated shop steward. Conversely, the personnel manager who tackled his job on the lines that he was merely going to be a production man, but rather more cunning in his approach, would not introduce anything new to industry.

The personnel manager had to be a man (or a woman) of balanced outlook ; he had to say : "I am part of this institution." It did not matter whether it was a coal mine or any other kind of establishment ; the personnel manager, if he was wise, would say : "I am in this organisation to serve its ends." It was essential, of course, that the people who were over the personnel manager—the works manager or managing director, or whoever it might be—should be sufficiently enlightened to believe in the idea of personnel management, and they should realise that the function of the personnel management department was to further the ends of the organisation, whatever they might be, and to do so by combining the interests of the workers with those of the management.

With regard to "selling" the personnel manager to the various departmental managers whom he had to serve, the whole point there was to explain the purpose of personnel management as something to be dovetailed in to the purposes of the whole organisation. The individual departmental managers must accept the idea that the personnel department was there to serve them, to find and train their employees. The policy differed in different places. Their own present policy was that the personnel department should not only find the workers, but take them a considerable way in their elementary training before turning them loose. It had to look after the interests and the troubles of the workers as industrial workers. There was no real reason why a departmental superintendent, manager or foreman should resent the attentions of the personnel department, any more than he resented the attentions of the maintenance men who came to look after the machines in his department, or the people who came to clean the windows. The personnel service was a means to an end. It happened to be a human service as well, but he did not think that it differed from any of the other multifarious services which were provided in industry.

MR. KERR asked whether it was to be inferred from what Mr. Chelioti had said that the man or woman who held the position of personnel manager would have a status similar to that of a normal works manager.

MR. CHELIOTI said he did not try to do that in his own practice ; he thought that that would be putting the status of the personnel manager a little too high for harmonious working. He tried to have the personnel manager immediately responsible to the works

manager. He was speaking now of a group of factories. The personnel manager in any given establishment had to satisfy the manager there for all day-to-day purposes, and for all such purposes was responsible to the works manager there, but he got from the personnel manager at headquarters guidance on certain matters of policy and routine. Headquarters, however, did not interfere with his work in his own factory. It would be impossible to have successful personnel management in any factory unless one had first of all educated the works manager to believe in personnel management. If one had a works manager who did not believe in personnel management, it would be no solution to give the personnel manager equal status with the works manager; one would get neither personnel nor works management in that way.

MR. BULLOCK remarked that Mr. Chelioti had reiterated the well-known axiom that management or anything else could achieve genuine leadership only by securing willing co-operation. At the low levels, he pointed out, there were various financial and other inducements which persuaded the operators at the shop level to give their co-operation to the management and to work harder, but he would like to have some comments on the operation of that process at the higher levels; in other words, the general line or attitude that a managing director should take with his immediate subordinates in order to obtain the greatest degree of co-operation from them.

MR. CHELIOTI replied that he had a ready-made answer to that question. He had talked a lot about it, and even thought about it, and his belief was that at every level the principle was the same. A managing director, for instance, would have four or five senior executives directly responsible to him. It was essential that he and they should be integrated in a team; he must have their loyalty and they must have his. There was no golden rule, but roughly he believed that at every level every executive should have constant contact with those immediately responsible to him, not only as individuals but as a group; he should regularly meet them as a group. Every managing director and his managers should regularly meet as a sort of executive board—not as the main board of the company, of course, but to discuss the implications of the policy which was handed down to them from the main board, and to join together in the interpretation of policy.

After all, the work of every executive was very largely the interpretation of policy. It could be said that in operating any large concern one had pure policy at the top. Members of the board who never went out of the board room and who were never seen in the factory, took part in framing the policy of the company, deciding whether it should make locomotives or fountain pens, and so on. At the other end was the man who pushed a broom, and who

simply did what he was told. At every level in between, every chargehand, foreman, superintendent and designer had not only to do what he was told, but to bring his own knowledge and judgment to bear on it, and his work was partly carrying out what he was told to do and partly applying his own judgment to it.

Personally, he believed that the success of industrial co-operation and of co-operation in most fields of human endeavour, depended on every man trying to form a team with those immediately responsible to him. Even a genius in administration—and genius was not very common in industry, when all was said and done—was unlikely to be able to direct half a dozen subordinates unfailingly in such a way as never to make a slip ; even a genius in administration was unlikely always to tell them precisely what was right, and always to be consistent with himself when he saw them separately. It was very much better that he should see them as a team and talk over common problems with them. He was the leader of the team, but it did him no harm to submit matters of importance to their judgment and hear what they had to say. If the leader was a good leader he would not be afraid of that, and if better views than his own were put forward in conference, he would adopt them. He would have the deciding voice, however, in all such matters.

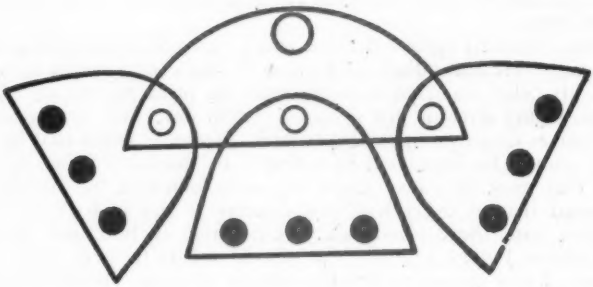

FIG. 2.

Each one of his subordinates should form himself into a team with those next to him. Personally, he had tried to do that for many years, and he believed that there was something in it. That could be represented diagrammatically (Fig. 2) with a large circle for the managing director, smaller circles for his immediate subordinates and filled-in circles for their subordinates, and in that sort of way they were all linked together like chain mail, and from level to level

there was not only a continuous chain of authority, but also a constant chain of consultation. He believed that to be extremely valuable, and he saw no reason why it should not go right down to the shop floor, in an ideal society, such as did not exist as yet.

MR. BULLOCK asked whether Mr. Chelioti agreed with the dictum of Mary Parker Follett that the best way to obtain obedience to instruction would be to invoke the law of the situation.

MR. CHELIOTI said he agreed with that profoundly. She said something like this, that every sound instruction grew out of a situation and not out of an intuition in the individual's brain, and therefore the gifted administrator was not the man who contributed novel thought when any problem arose, but a person who appreciated the facts of the situation as each situation arose, and the one who saw the logic of the situation quicker than others and could express in words what the situation required to meet it. He believed that profoundly, and that was one of the best arguments for the system of constant joint discussion about which he had been talking, because those who were responsible to a man would then have a much clearer grasp of the situation, and if the man was any good they would see that he was, in fact, giving them instructions or arriving at decisions, jointly with them, which arose out of the facts of the situation and not merely because he chose to say that something had to be done in a particular way.

MR. MICKIE, dealing with the question of the structure of organisation, pointed out that years ago the head of a production department, for example, was lord of all he surveyed, but now, with so many functional specialists coming in—the cost accountant, the personnel manager and so on—could it be said that the position was still very much the same? In other words, was the ultimate responsibility still with the line superintendent, and was it simply advice which could be rejected which was offered by the functional specialists, or was it something more than advice, because if the line superintendent rejected that advice a strike might be called or costs might go up?

MR. CHELIOTI remarked that that was another very interesting question. He did not know that there was a general answer to it, because the functional departments offered such a variety of services. He regarded the designs department as a functional department; it was something which contributed to the line flow. The line flow could not operate without designs any more than without material. The buying department was another functional department. It was interesting to consider how all those departments impinged on the authority of the departmental superintendent. One could hardly say that one would wish the departmental superintendent to be able to ignore the instructions of the design department; he did not think that anybody would say that. On the other hand, he thought

that the general structure of the organisation of the concern should be such that the design department would listen to the views of the shop superintendent. If they did not, he would like the relationship to be such that the practical production man would have an opportunity of ventilating his views in other ears, before a wider audience than the design man himself.

There were so many departments. Nobody would deny the right of the shop superintendent to tell the buying department that the stuff which they were buying for him was bad. That was an elementary right which every wise managing director would see was exercised if necessary. The best general answer that he could give was that he liked to think of the production staff, the people who carried the line authority, as accepting the services or accepting the advice of all the functional departments, but always with a right to express their dissent. The functional departments could never have authority to give instructions in the manufacturing departments.

He would like to give a practical example. At one of his factories there were the two main divisions of authority right up at the top responsible to the works manager, who was a very responsible man responsible for a number of factories. His two principal executives were a production manager and a technical manager. The technical manager was responsible, among other things, for the quality control. The technical manager's assistants were at work in all the production departments, carrying out checks. They were accepted as a normal phenomenon by all the production staff, and what they said went ; if they condemned a batch of goods, then that batch of goods remained condemned until something was done about it. If, however, the production staff at the particular level where that rejection had occurred did not agree with that rejection, but thought that the quality man was reading his specification too literally, or if they disagreed with it for any other reason, they could always go to their own superiors, and the dispute, if pushed up far enough, would come to the production manager and the technical manager. If they could not settle it amicably they would go to the works manager.

He did not find that that led to sore heads. The fact was that most questions were settled at the lowest possible level by people who did so on their own responsibility, and in the full belief that they were being loyal to their own chiefs. It was a little like labour relations ; it was a very good principle to say that the best solution of any labour problem was that arrived at between the shop steward and the foreman, and the worst that which went through all the intervening stages. It was the same with any dispute between a functional department and a line authority.

MR. SHEED asked whether Mr. Chelioti would consider that the very simplified line diagram of authority which he had drawn would

be better represented by a figure 8, with the managing director right at the centre.

MR. CHELIOTI agreed that that would do, and said it was a slightly poetical conception. One might use the hour-glass form, or two pyramids, the top one inverted, which was also a legitimate concept.

MR. SHEED said that his point was that the circumference of the figure 8 would represent the line of authority rather than the actual volume of it. He thought that the authority of the managing director rested upon his ability to convert the energy of finance into the energy of production and to re-convert that back again into finance, so that there was a closed circle of finance flowing through to the managing director and then out transmuted by him into production activity, and then changed back into finance and passing back through him to the shareholders. The authority of the managing director appeared to rest on his ability to change that energy from one form to the other and back again.

MR. CHELIOTI agreed that there was a great deal in that idea, but said that he had been talking from the point of view of management only. They were all concerned in one aspect or another with the general question of management, *i.e.*, the guidance of a flow of energy. He had talked only of the delegation of authority. He had started by saying that the nature of man was such that he could not work effectively in teams unless somebody had the authority to co-ordinate and guide those teams ; but if one regarded the process from a different angle altogether, and thought in terms of energy or finance, obviously all those officials—the managing director and all the others—were all people who were controlling a flow of energy, a flow of material or a flow of finance—they were all largely interchangeable terms. The Marxist economists said that the source of all wealth and all finance was human labour, and other economists gave slight variations of that idea ; but all those concerned with management were concerned with something dynamic, which meant with something moving ; they were all concerned, as managers, with change. In an absolutely static universe, in which nobody had any wants, nothing would flow and no management would be needed ; it would be a sort of absolute zero of human life. However, as all human beings had desires, and as a large part of their desires, in a civilisation such as ours, could be expressed in terms of food, goods, amusements and so on, it was necessary to deal with flows of energy, and the conception which had been put forward was absolutely valid, and could be made the subject of effective diagrams. Authority in industry in our present society depended largely on money ; it was the man who put up the finance who had the last word in saying what should be done ; but the man who merely put up the money was going to lose it unless the people

in between were competent, and that limited his authority to some extent.

MR. MARSDEN said that the paper and discussion raised the important question of where administration ceased and where executive authority began. Mr. Chelioti had drawn very clear lines of management, but in practice the lines were not at all clear, and one found policy-making people doing executive work, and so on. It would assist the imagination to realise that at one particular level the administration was being done, and the decisions were carried out a little lower down. In the diagram which Mr.Chelioti had drawn, the smaller sausage, marked B, was where the administration was done, and if that department was well manned it would not matter in the least what was the quality of the sausage at the top, A, or the quality of the sausage at the bottom, D.

MR. CHELIOTI replied that in the case of mining, it is the bottom sausage which gets the coal.

MR. MARSDEN agreed, but said that correct thinking at the level of administration might enable one to do without a man at the bottom and to let gravity do the work.

MR. CHELIOTI suggested that gravity would not bring the coal up.

MR. MARSDEN pointed out that it was used to bring slate up in North Wales, because enough water was put on the other side. The questions and answers, he said, were tied up with the difference between the administrative levels and the executive levels. Where an enterprise had an objective and a policy for carrying it out, and where the administration made the policy clear to the executive and the policy was a good one, half the difficulties visualised in some of the answers did not arise. It would be of interest, therefore, if Mr. Chelioti would make it clear where administration began and ended and where executive work began and ended.

MR. CHELIOTI remarked that he would try to answer that question by rejecting the word "administration" altogether. The word was used in so many different senses ; some people used it to mean quite a low grade, and others to mean quite a high one, and, in fact, a very high one. The administrative level in the Civil Service meant something quite different from its meaning in some other connections.

He preferred to think of these matters in terms of policy and execution. Policy in its full purity, he believed, was concerned only with objectives ; everything else was execution. He believed, however, that there was no abrupt boundary between policy and execution. Planning, for example, might be put in between policy and execution as a third conception, differing in kind from the other two, but he was more inclined to look on planning as part of execution. If one thought in terms of warfare, the main policy of war was a matter for the Cabinet ; the Cabinet decided whether we should go to war at all—or wished that it could do so—and with whom we were to

fight, and a few important things of that kind, but once the matter got into the hands of the War Office the planning started. The Cabinet did not plan anything at all, and yet he would call the War Ministry an executive department. The "brass hats" who did the planning, and who perhaps never saw a shot fired, were undoubtedly concerned with the mysterious process of changing a policy into action, but he believed that they belonged to execution.

He believed that policy was entirely abstract, or at any rate he preferred to look on it in that way, and therefore he said that the policy of a company might be formed in the board room, but a managing director, except in so far as he was a member of the board, was an executive. He himself was a member of several boards, but he was also a general manager of part of the activities of the General Electric Company, and that was what took up the majority of his time. As a member of the board he might just as well be a Member of Parliament or somebody right outside industry ; his membership of the board did not increase his authority as a general manager of a section of the company, and he was just as much responsible to the managing director as though he was not a member of the board. On the other hand, the fact that he was a general manager of a part of the company gave him no more authority on the board than if he were a Member of Parliament. There were many who, like himself, had to regard themselves as though they were two or more separate people. He was a member of the board and also a general manager, and he even did some work ; and he also held a few shares—he had to do so to qualify for membership of the board. He was therefore part of the sausage at each end and also something in the middle at two or three levels, which was the way things were nowadays.

MR. B. H. DYSON, who took the Chair when the Chairman had to leave the meeting, offered apologies on his behalf. The Chairman, he said, was a sick man but had insisted on coming to introduce the speaker. Personally, he found it very encouraging to see the large audience present that evening to hear a paper on management functions, because he had thought for a long time that the spotlight had been put far too much on direct production operations and not sufficiently on the subject of production management. It had been shown that evening that even more interest could be taken in discussing management problems than in the discussion of some of the direct shop production problems, and he believed that that was a very good sign.

Mr. Chelioti had taken them through many realms that evening, from the Prime Minister and the Government to the boys who brought round the tea. That, of course, was just the problem of management structure ; the structure encased so many different activities.

One often heard or read into speeches and articles those things

that one wanted to hear or to read, and often missed things that one did not want to understand ; but he had noticed that early in the meeting Mr. Chelioti had referred to an "aggressive" personality, and personally he believed that that was something which was lacking in industry to-day. It depended, of course, on the interpretation given to the word "aggressive", but he found that it was much easier to find men with ideas than men who could make ideas work. In fact, on his recent visit to the United States he was told that they were finding that 10 per cent. of the people in an average organisation had good ideas, but they could find only 2 per cent. who could make good ideas work, very often because of a lack of aggressive personality.

The reference to the tea and gate boy reminded him of an incident which occurred a little while ago which showed that a certain managing director had his tea and gate boys well under control. Personally, when he first went to the factory he had been very anxious to inquire what was going on inside and what was being done. The first time the boy gave him the answer : "Well, guv'nor, I've only been here a couple of weeks and I can't tell you anything about it." He accepted that, but when three months later he got the same answer, he realised that the managing director had that boy well under control.

As was to be expected, the question of monotony had been mentioned. To his mind there was no such thing as monotony ; there was only a wrong attitude of mind. If anybody talked to him about monotony he always referred to the case of the actor who had to act the same part six days a week with two matinee performances, and might continue to do so in the same role for 4 or 5 years. If anything was monotonous, that must be.

Whether it was by chance that the word "link" was used when talking of getting people to work in little teams he did not know, but in the method which his own organisation used for people to get together with those immediately below them, those meetings were called "link meetings".

MR. TOWNSEND, in proposing a vote of thanks to the author, which was carried with acclamation, said he was sure that all those who had had the good fortune to attend the meeting would agree that it had been most interesting and instructive. The subject was one in which engineers must undoubtedly take much more interest in the future than they had taken in the past. In their interest in their own function as engineers they sometimes forgot that there was such a thing as the function of management. They had been given plenty of food for thought that evening, and would have learnt a great deal.

MR. CHELIOTI, in reply, said he had greatly enjoyed the evening, and particularly that part of it which had been devoted to questions

and answers. It was most gratifying to find such vigorous interest taken in the subject and to see so large an audience.

He would like to say one further word about monotony. Mr. Dyson did not believe that there was such a thing, but personally he thought that there was, and that it meant literally evenness of colour or of experience so that it was constantly repeated. There were special reasons why the work of the actor did not become monotonous ; he had the response of the audience on each occasion. No actor would perform the same part before the microphone every night for four or five years. When speaking of monotony they were really referring to boredom, and he believed that it was largely, if not entirely, subjective. If a person was bored, it was at least as likely to be his own fault as that of the circumstances in which he found himself.

The meeting then terminated.

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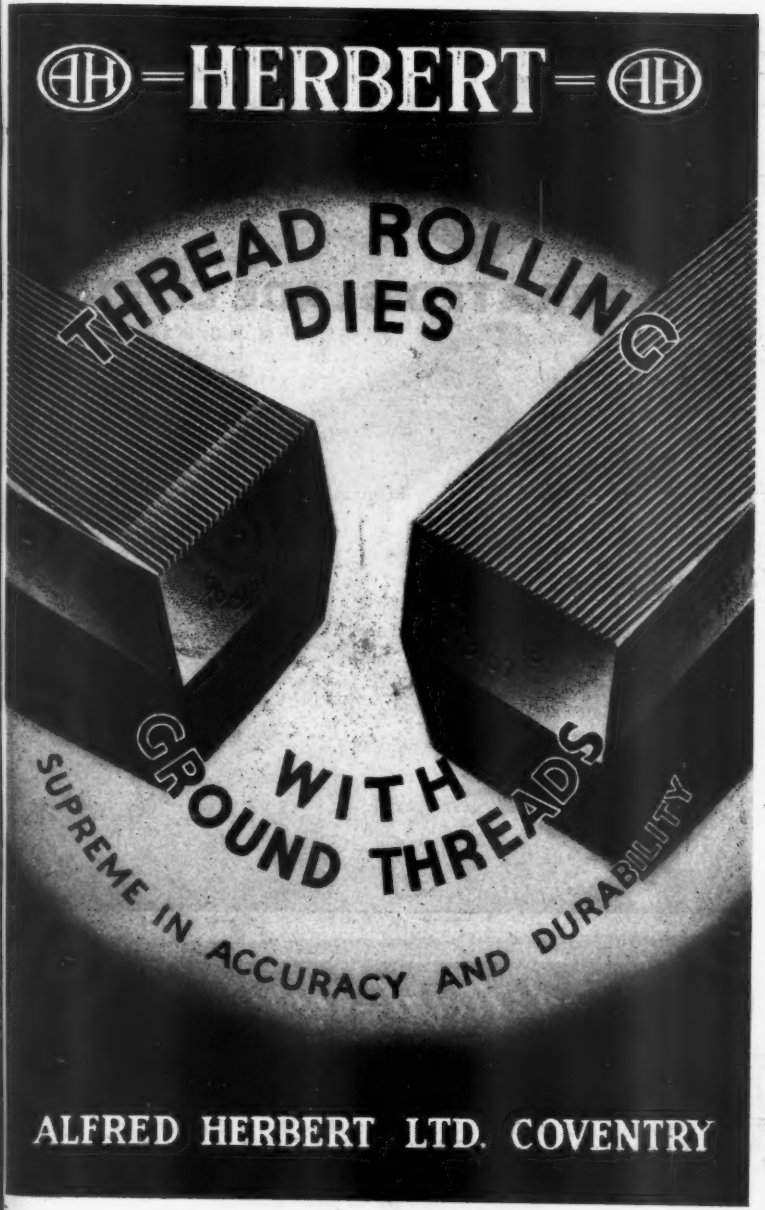
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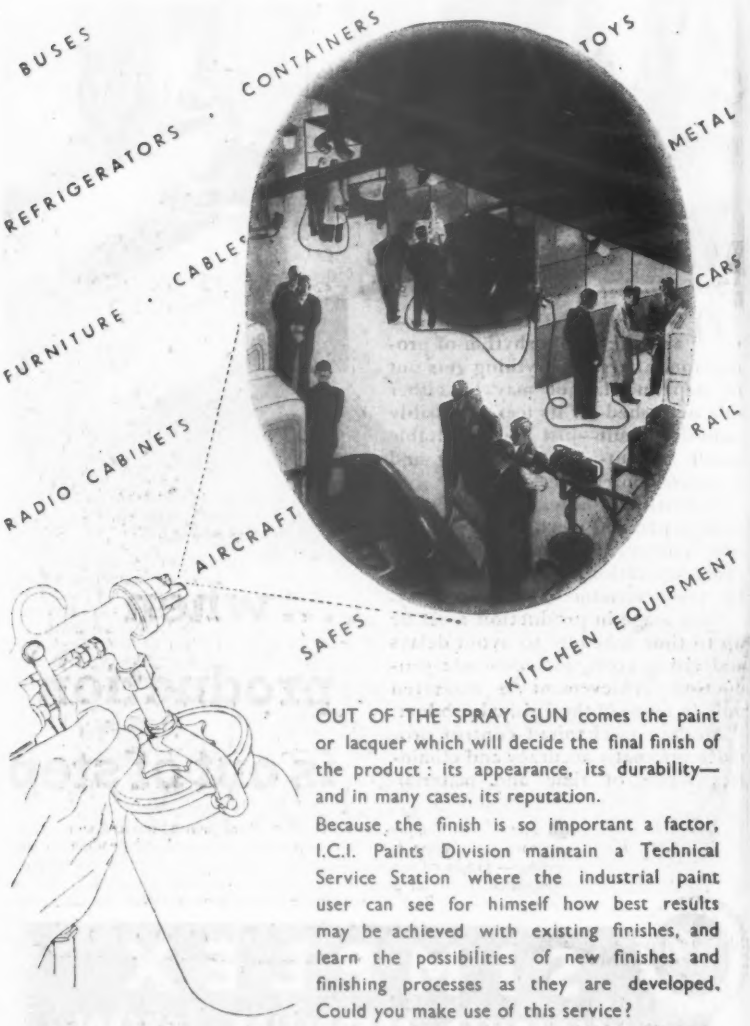

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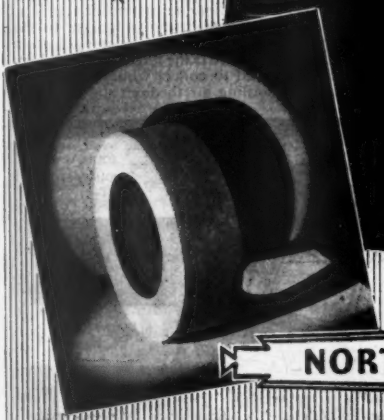

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Standard practice is to fit roller-bearings at the drive end and ball-bearings at the opposite end.

ACTION

When the stator winding is connected to the supply, the currents produce a revolving magnetic field which induces currents in the rotor conductors.

The rotor currents react on the stator field in such a manner that the rotor turns in the direction of the revolving field. The rotor speed is always slightly lower than the speed of the revolving field. At full load the difference in speed—known as the "slip"—may be from 3 to 5 per cent.

CONSTRUCTION

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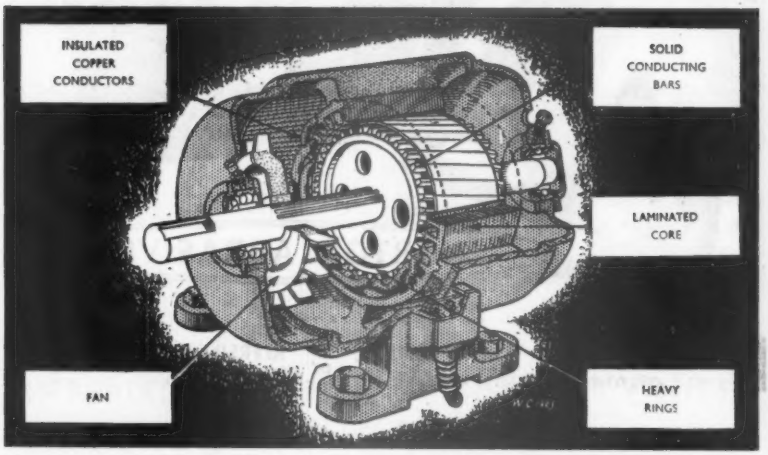

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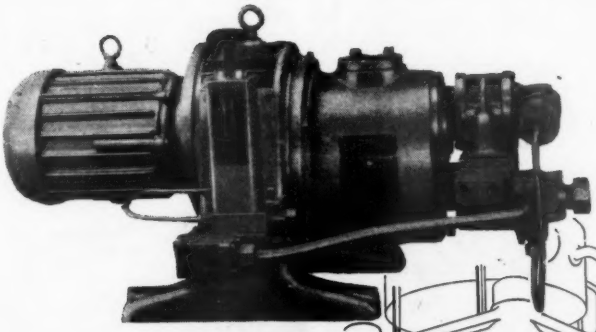
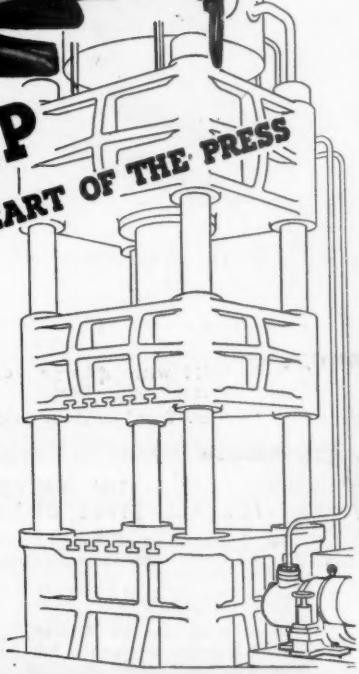


THE PUMP
IS THE HEART OF THE PRESS



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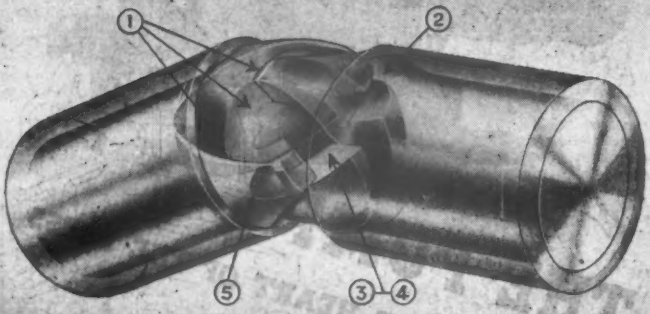

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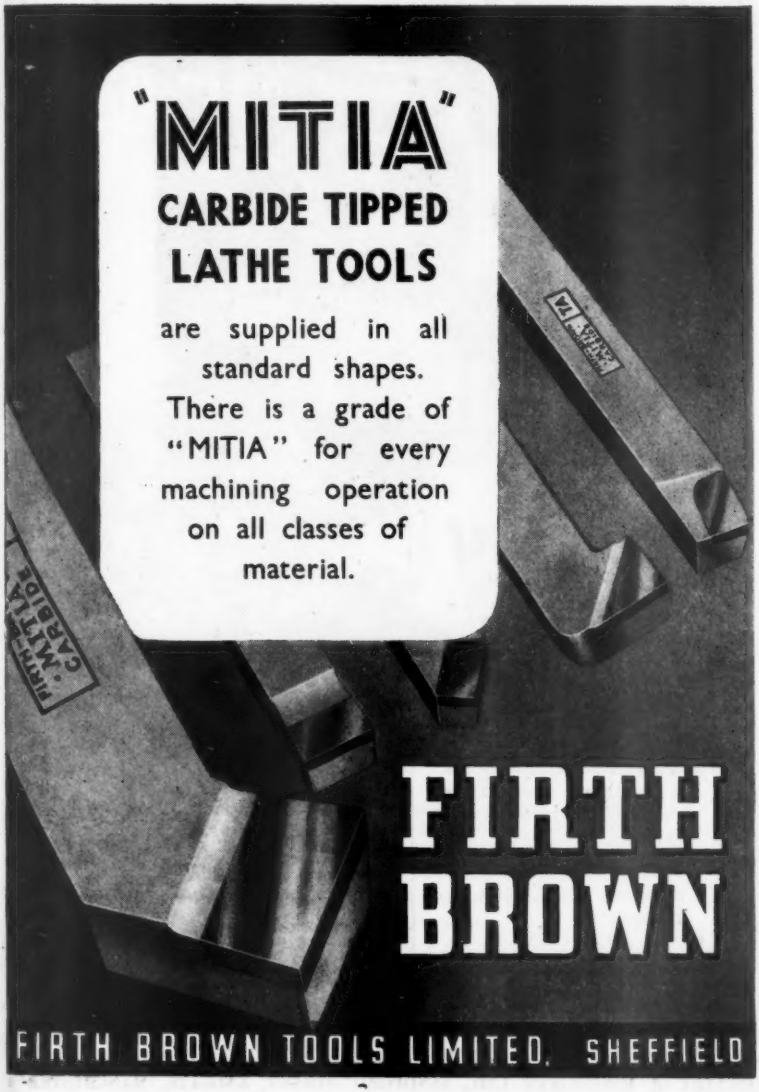
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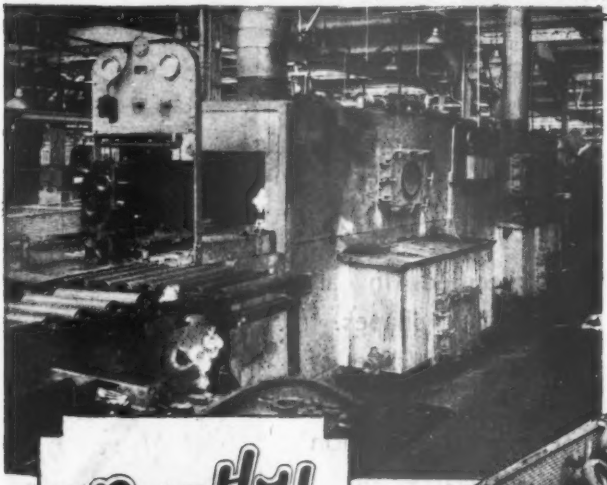

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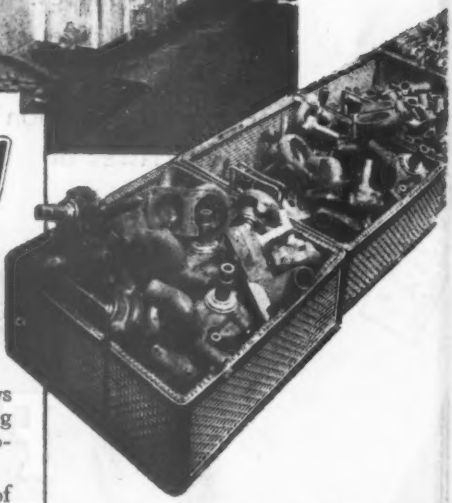
This illustration shows a machine cleaning crank cases in the production line.

It is equally capable of cleaning small parts in baskets.



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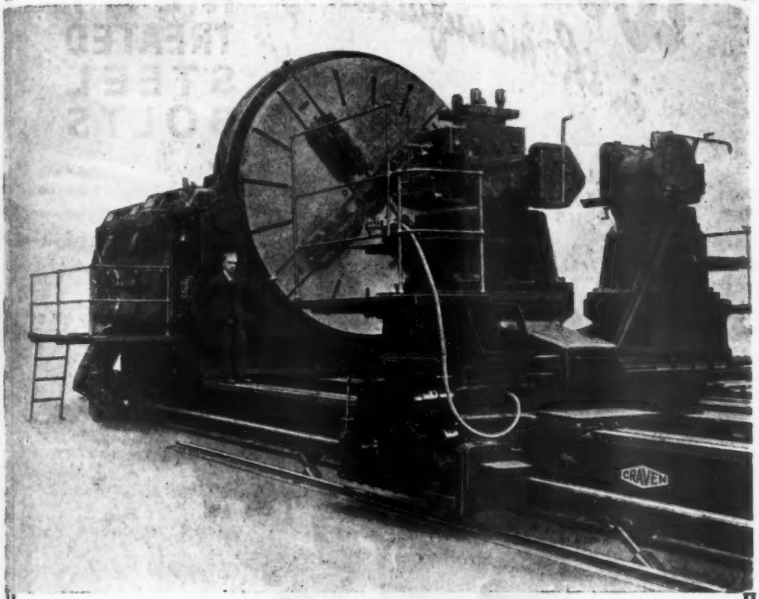

The illustration shows the driving headstock, left-hand front rest and rear saddle with grinding attachment of a 94 in. centre lathe for machining turbine rotors.

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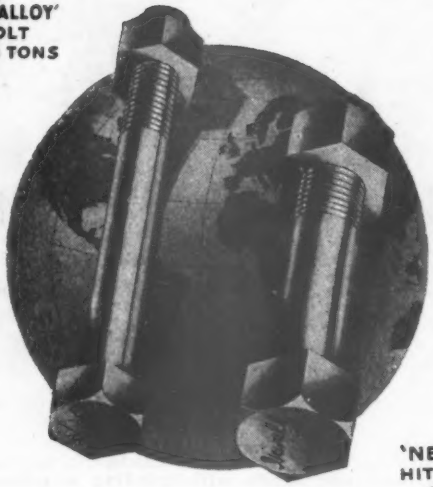

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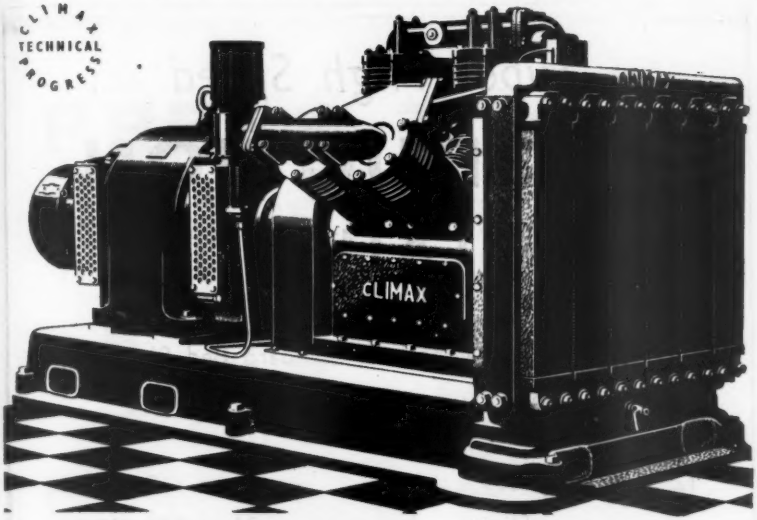

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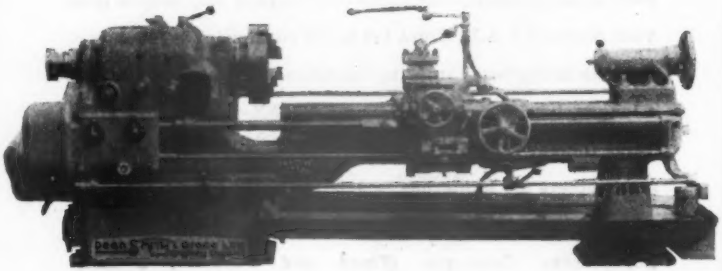

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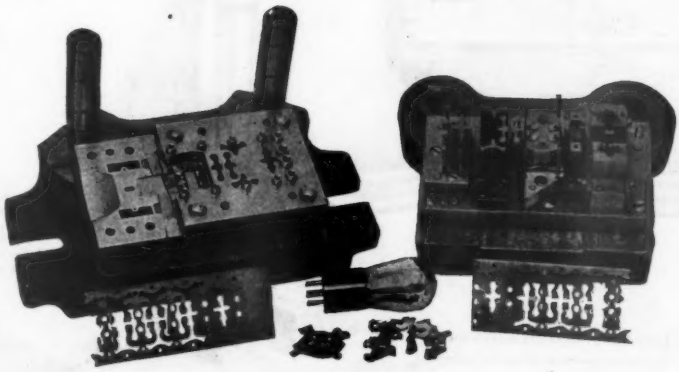

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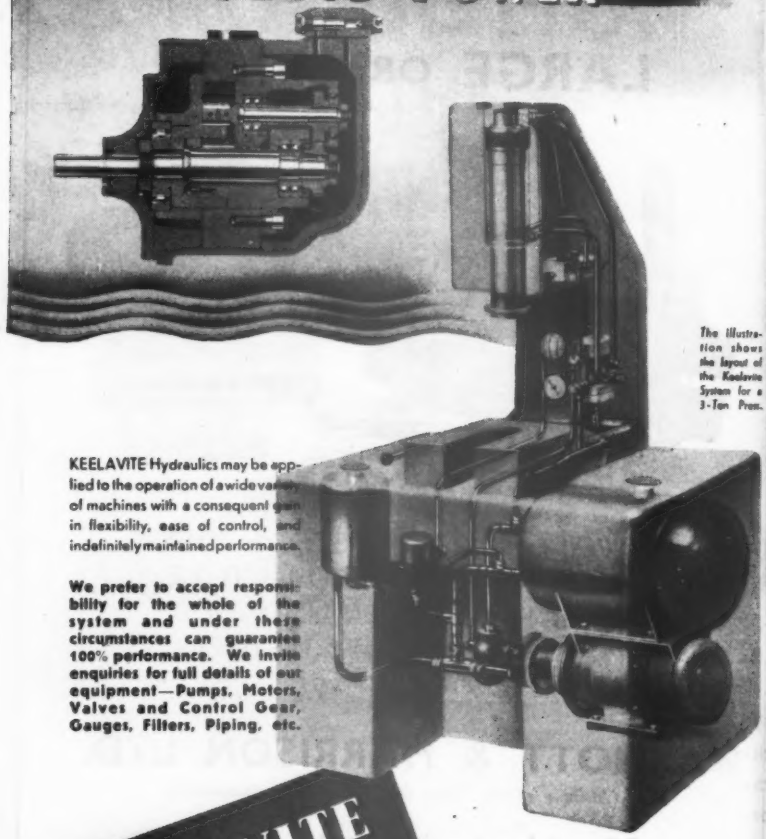

The Illustration shows the layout of the Keelavite System for a 3-Ton Press.

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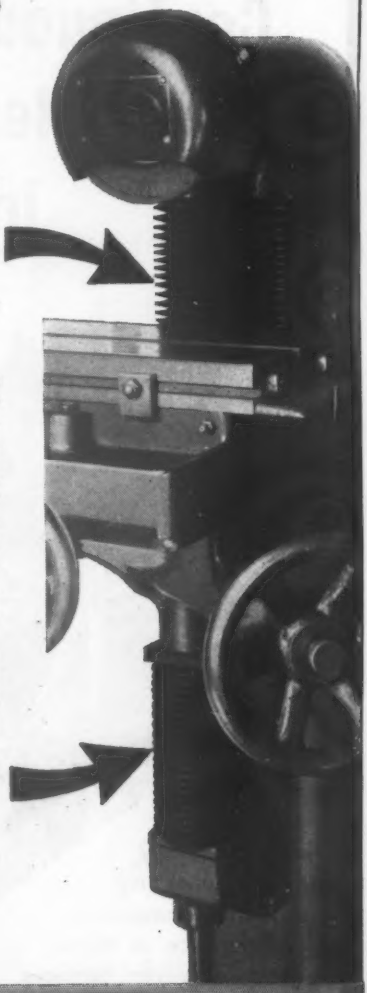

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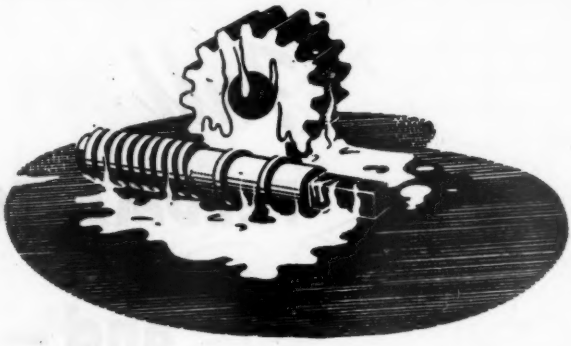

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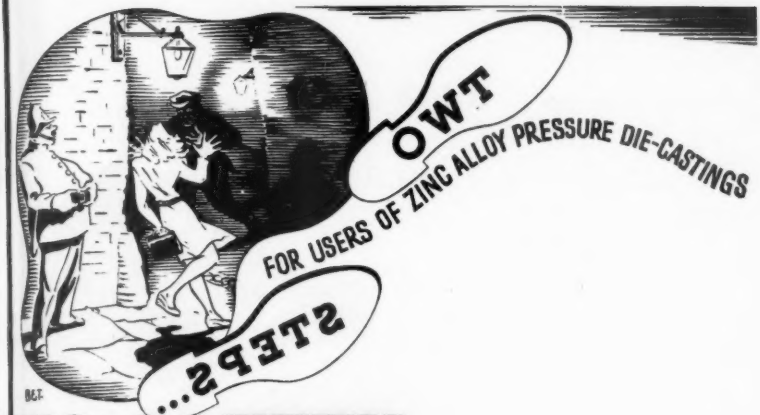

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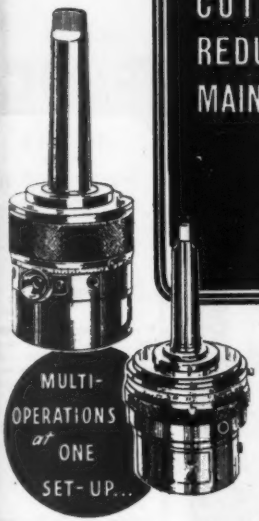

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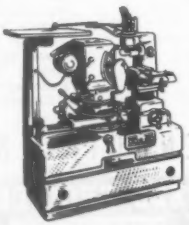

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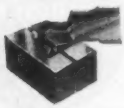

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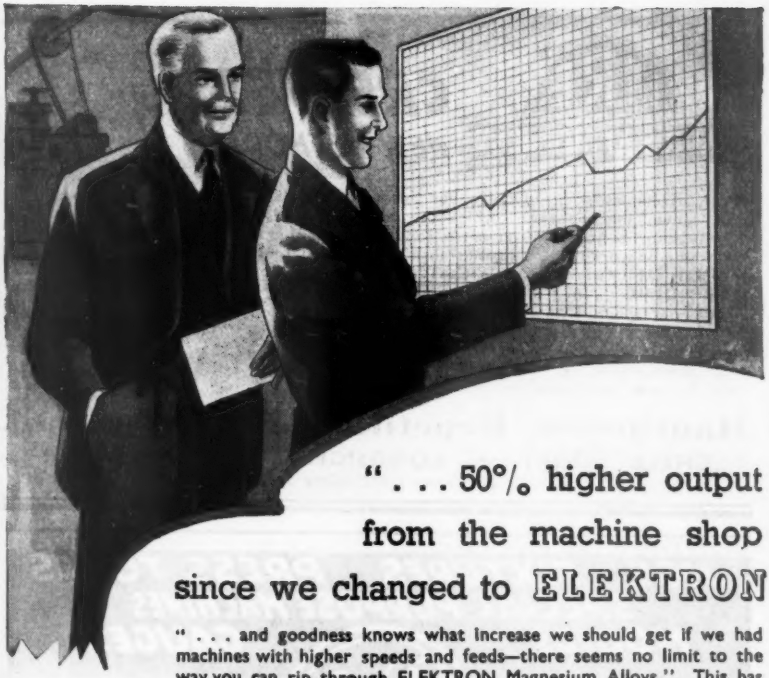

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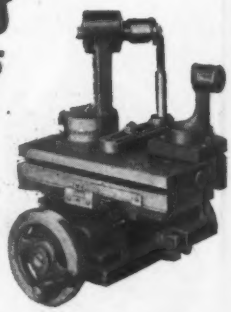

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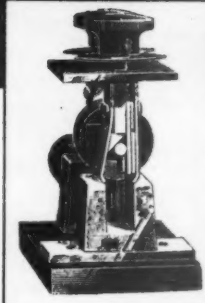

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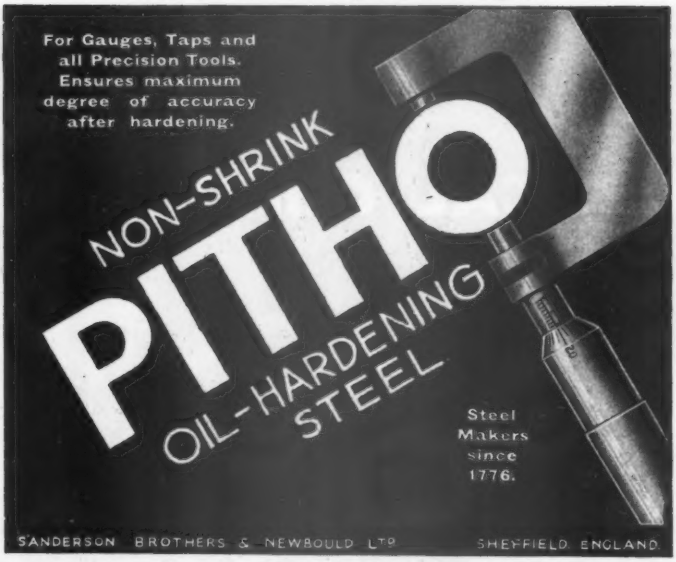
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And then this bloke invents this 'ere tool. Doosooter it's called and don't ask me to spell it. Light ! A baby can use it. *You* can use it. You with your legs like a sparrer's and your arms like a couple of bent straws. *You* won't get no bleedin' knuckles. *You* won't go 'ome cryin' for tiredness and fall asleep with your face in your supper. Soft ! That's what you'll be. Just a pore little squiddlum ! I'm sorry for you, son, I am. Straight ! You bin born too late.

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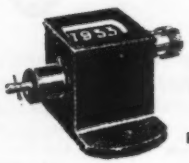

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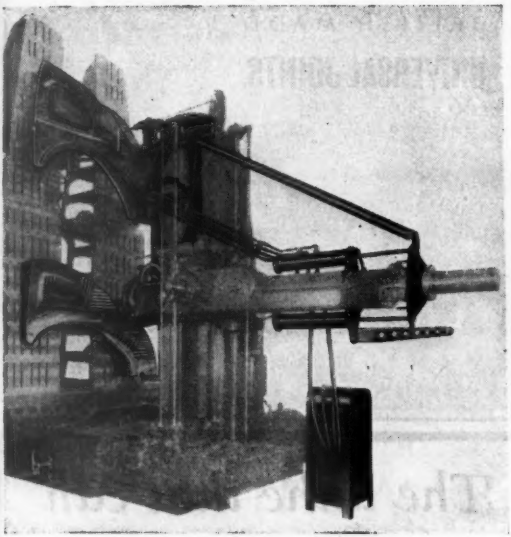

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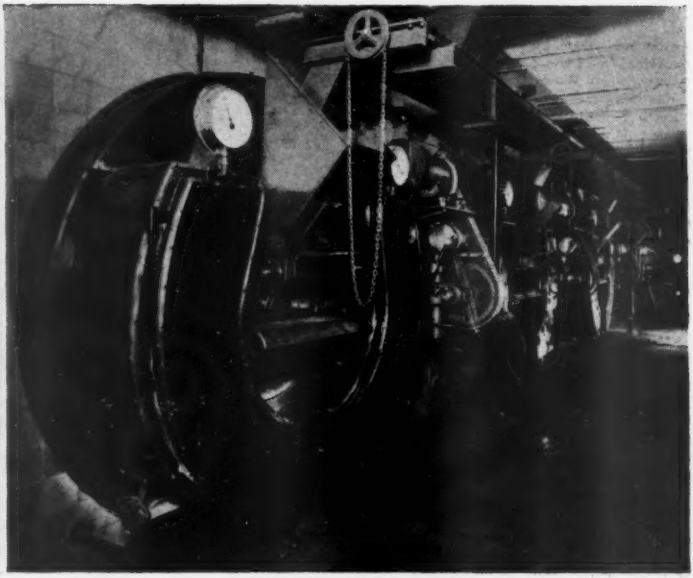

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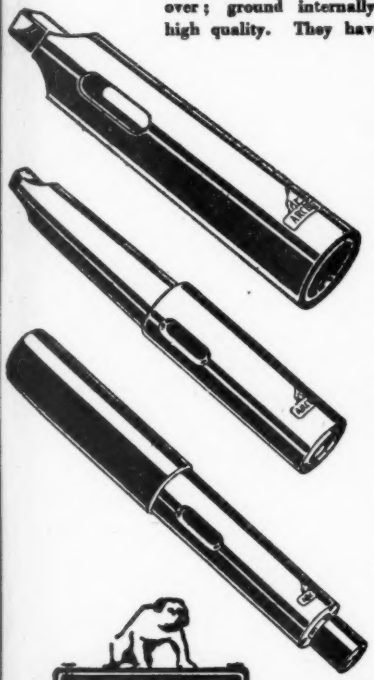

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